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# Low Farm Incomes and the Rental Market for Cropland in Vietnam

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**A thesis**
**submitted in partial fulfilment**
**of the requirements for the Degree of**
**Doctor of Philosophy**
**at**
**Lincoln University**
**by**
**Hoang Trieu Huy**

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# Declaration

This work was completed under the supervision of Associate Professor Michael Lyne, Dr Nazmun Ratna and Dr Peter Nuthall at Lincoln University, New Zealand. The work has not previously been submitted, either in whole or in part for a degree at this or any other university. To the best of my knowledge, the thesis is original and contains no materials previously published or written by any other persons except as acknowledged in the text.

Hoang Trieu Huy

Abstract of a thesis submitted in partial fulfilment of the requirements for the Degree of Doctor of Philosophy

# Low Farm Incomes and the Rental Market for Cropland in Vietnam

by

Hoang Trieu Huy

Farm incomes in rural Vietnam are tightly constrained by very small farm sizes, highly fragmented land holdings and cost inefficiency. Despite a very successful land registration programme, the rental market for cropland is considered to be inefficient in many parts of rural Vietnam. Given stringent limits on the area of farmland that individuals may own, imperfections in the rental market prevent farmers from consolidating land parcels, growing their farm enterprises, adopting new technology and increasing both their incomes and those of non-farming rural households. The overarching objective of this study is to examine the efficiency and equity impacts of the cropland rental market in rural Vietnam and the efficiency of the rental market itself.

A conceptual framework was drawn from the literature to link policies, tenure security, transaction costs, cropland rental markets and agricultural productivity. A theoretical model was proposed to explain rural household participation in the cropland rental market subject to transaction costs, and testable hypotheses were drawn from this theoretical framework. For empirical analysis, a stochastic frontier model was employed to explain the performance of farming households in rural Vietnam and to examine the effect of cropland rental market participation on this performance. A generalised ordered logit model with shifting thresholds accounting for the effects of transaction costs associated with market participation was specified and estimated using pooled data from the Vietnam Household Living Standards Surveys of 2004 and 2008. No previous studies had attempted to measure and test for asymmetric transaction costs in a land rental market. In the context of Vietnam, this study is also the first to measure responses in cropland rental markets since the 2003 Land Law was passed. Some key findings, conclusions and recommendations emerged.

First, it was found that the efficiency of the rental market had improved over the study period and rental transactions were creating an emerging commercial farmer class. The survey data showed a trend of increasing participation in the rental market by rural households to adjust their farm sizes, although the level of market participation and the scale of transactions varied across regions. It was concluded that Vietnam's land reforms over the previous twenty years had done much to strengthen tenure security and it was

recommended that the government should step up its efforts to complete the land registration programme.

Second, it was confirmed that voluntary rental market transactions had promoted farming efficiency in Vietnam. The results of a stochastic frontier analysis showed that lessees were consolidating and extending their farming operations, and were more technically efficient than lessors. They also showed that crop production could increase by 15 per cent with existing technologies. Third, the study found clear benefits for both lessors and lessees. It was concluded that there was merit in Vietnam's cautious approach to a land sale market and that a more efficient rental market could contribute significantly to crop production.

Fourth, it was found that the rental market, and hence its efficiency and equity benefits, was constrained by high unit transaction costs. Importantly, the results highlight sources of transaction costs that affect lessors and lessees differently, and signal the relative importance of their impacts. Registration of land rights and the application of zoning regulations affect lessors and lessees differently, but their impacts on land use efficiency are unambiguous. These are important sources of transaction costs and it was recommended that, in addition to completing the land registration programme, the government should consider relaxing restrictions on the use of wetlands to grow crops other than rice. Ethnic diversity is also an important source of transaction costs, and more so for lessors than for lessees. However, from a policy perspective, there may be little that the government can do in the short-term to address the issues embedded in ethnic diversity - an area that requires more research. Physical infrastructure is a significant but relatively less important source of transaction costs. It was found that the provision of all-weather roads in communes encourages participation equally on both sides of the market, whereas access to telephones and a local radio station promote only the supply side of the market. It was recommended that public resources should be allocated to commune roads ahead of telephone services and local radio stations, which are also more likely to attract private investors.

**Keywords**: land rights, transaction costs, land rental market, efficiency, equity, Vietnam

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Whilst efforts have been made to ensure that this thesis is presentable, any pitfalls by way of errors or inadequacies are my sole responsibility and should not in any manner be attributable to individuals and institutions that have rendered assistance.

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# List of Abbreviations

| | |
|---|---|
| CH | Central Highlands |
| DEA | Data envelopment analysis |
| FAO | Food and Agriculture Organization of the United Nations |
| GADM | Database of Global Administrative Areas (for maps) |
| GDP | Gross domestic product |
| GSO | General Statistics Office of Vietnam |
| HYV | High yielding varieties |
| LRM | Cropland rental market |
| LUC | Land use right certificate |
| MLE | Maximum likelihood estimator |
| MRD | Mekong River Delta |
| NCC | North Central Coast |
| NE | North East |
| NW | North West |
| RRD | Red River Delta |
| SCC | South Central Coast |
| SE | South East |
| SFA | Stochastic frontier analysis |
| TRC | Transaction costs |
| UNDP | United Nations Development Programme |
| USD | United States dollar |
| VASS | Vietnamese Academy of Social Sciences |
| VHLSS | Vietnam Household Living Standard Survey |
| VIF | Variance inflation factor |
| VND | Vietnam Dong |
| WB | World Bank |

# Chapter 1

# Introduction

## 1.1 Background

Vietnam recorded impressive economic growth and poverty reduction during the 1990's in response to market-oriented policy reforms (WB, 2006a), including ambitious land reforms in 1988, 1993 and 2003. However, there are concerns that the reforms have not produced institutions strong enough to support efficient markets in all sectors of the economy, and that growth has slowed - particularly in the agricultural sector (Gaiha and Thapa, 2007; Hansen and Diaz, 2008). Recent estimates of Vietnam's economic development convey clear messages: first, with some 48 per cent of the population living on less than US$2 a day in 2006, Vietnam remains one of the 40 lowest-income countries in the world (WB, 2009). Second, more than 80 per cent of the poor are located predominantly in rural Vietnam, where their livelihoods depend primarily on agriculture (VASS, 2007). Third, while the agricultural sector accounts for only 22 per cent of national GDP, it employs approximately 54 per cent of the country's labour force (GSO, 2009b). Consequently, returns to agricultural labour (US$305 per annum) amount to less than one-half of national labour productivity[1] (US$770 per annum) and, in 2003-2005, relegated Vietnam to a group of 20 countries with the lowest agricultural labour productivity in the world (WB, 2009). Crops account for a third of farming household income, but earn each member less than US$0.5 per day[2]. Inequality between rural and urban areas is widening - the ratio of urban to rural per capita expenditure rising from 1.91 in 1993 to 2.24 in 2004 (VASS, 2007).

Recent statistics also show that the average area of cropland operated by farmers in Vietnam is only 0.63 hectares (VASS, 2007). Not only are the farms amongst the world's

[1] Returns to agricultural labour, defined as agricultural value added per worker, can be seen as agricultural labour productivity, while national per capita income can be regarded as national labour productivity.

[2] Estimated by the author using data from the 2006 Vietnam Household Living Standards Survey.

smallest (Eastwood, Lipton and Newell, 2010), they are also highly fragmented. Some 75 million cropland parcels are owned by almost 12 million rural households (Hung, MacAulay and Marsh, 2007; Kerkvliet, 2006) resulting in land fragmentation and land losses (of 2.4–4%) between plots (Phuong, 2008). There is considerable evidence that farms are cost inefficient (Hung *et al.*, 2007; Kompas, 2004; Vu, 2006). As a result, farm incomes are tightly constrained by very small farm sizes[3], highly fragmented cropland holdings and cost inefficiency. In fact, rural households that engage only in farming are the poorest in Vietnam (VASS, 2007; WB, 2006b). Rural households are shifting resources into livestock and non-farm enterprises, or are driven to migrate to urban areas in search of work (Minot, Epprecht, Anh and Trung, 2006).

Agricultural land is a key productive asset, a source of income, an insurance device and a social safety net to many poor rural households in developing countries (Ellis, 2000). Development economists and practitioners have long been concerned about efficient and sustainable cropland use with a view towards identifying policy options that have the potential to make everybody better off.

Existing literature suggests that voluntary cropland rental transactions have both efficiency and equity advantages (Crookes and Lyne, 2003). Allocative efficiency improves because the market imposes an opportunity cost on idle and underutilised cropland, which creates incentives for voluntary transactions that transfer this land to more effective farmers, i.e. farmers willing and able to make more profitable use of the land (Lyne and Nieuwoudt, 1991). Cost efficiency improves because the rental market allows farmers to exchange and consolidate cropland parcels (Norton, 2004). Perhaps more important than these static efficiency gains, the rental market allows effective farmers to grow the scale of their farming operations over time, making investments in knowledge and new technology more profitable; larger farms increase the revenue that can be gained from new technology while reducing the unit costs of adoption (Kille and Lyne, 1993). In addition, efficient cropland rental markets help overcome imperfections in

[3] In this study, farm size is measured as the number of hectares operated. There are different definitions of farm size found in the literature such as acres operated, amount of labour input, or gross farm sales (see, for example, Stanton, 1978).

markets for credit, insurance, labour and machinery services through interlinked contracts (Bardhan, 1989; Otsuka, Chuma and Hayami, 1992).

Viewed from an equity perspective, a rental market offers these efficiency gains without the threat of distress sales and a 'landless class' problem as it entails only a temporary transfer of certain use rights (Crookes and Lyne, 2003; Deininger and Jin, 2005). Lessors and lessees would not transact voluntarily unless the rental agreement offered benefits to both parties. Efficiency gains translate into higher levels of output and better employment opportunities on farms and in service industries (e.g., marketing, transport and processing) (Akram-Lodhi, 2004; Deininger and Jin, 2005; Vranken and Swinnen, 2006). Furthermore, cropland rental markets allow prospective farmers to 'scale the agricultural ladder' while also providing lessors with an opportunity to gain experience in non-farm occupations (Crookes and Lyne, 2003; Norton, 2004).

## 1.2 Research Hypotheses, Questions and Objectives

### 1.2.1 Basic Research Hypothesis

Given static and small farm sizes and persistently low productivity of farm labour, it is reasonable to ask if rental markets for cropland in rural Vietnam are efficient or not. It is hypothesised that rental markets for cropland remain inefficient in many parts of rural Vietnam, preventing farmers from consolidating cropland parcels, growing their farm enterprises, adopting new technology, and increasing both their incomes and those of non-farming rural households. As a result, inefficient land rental markets constrain agricultural productivity and the earnings of both farmers and non-farming rural households.

### 1.2.2 Research Questions

Some authors have examined the development of cropland markets in Vietnam (for example, Deininger and Jin, 2008; Do and Iyer, 2008; Ravallion and van de Walle, 2003); however, most of these studies were conducted in the context of the 1993 Land Law. There have been no attempts to measure responses in cropland markets since the 2003

Land Law was passed. This law strengthened tenure security by broadening the bundle of land rights assigned to landholders (see, for instance, Articles 105 and 106 of the 2003 Land Law). In theory, this should have enhanced the efficiency of rental markets for cropland and strengthened farming household incentives to invest in agriculture. Further, while it has been recognised that market failures are household specific (e.g., de Janvry, Fafchamps and Sadoulet, 1991), there is little empirical evidence of how market imperfections and household level constraints impact on participation in cropland rental markets, the volume of rental transactions and the amount of cropland transacted in Vietnam.

There is evidence of high transaction costs that prevent cropland rental markets from functioning efficiently in Vietnam. Numerous administrative regulations constrain land use (Marsh, MacAulay and Hung, 2006; Phuong, 2008), including zoning for wetland rice land (Kompas, 2004; Markussen, Tarp and van den Broeck, 2011). Procedures for transferring farmland use rights are cumbersome and costly, wasting time and raising transaction costs (Phuong, 2008; WB, 2002). Also, informal land transactions persist suggesting that transaction costs are high in formal cropland markets (Do and Iyer, 2008; Phuong, 2008; WB, 2002).

Insecure land tenure also raises transaction costs for those who wish to participate in cropland rental markets. For example, potential lessees face high, or prohibitive, fixed *ex ante* costs of finding the legitimate lessor. Some of the known causes of land tenure insecurity include the incomplete allocation of land use rights and the limited duration of these rights in Vietnam (Do and Iyer, 2008; Phuong, 2008). There have been some attempts to examine the effects of transaction costs and land tenure security on cropland rental market participation and investment incentives. However, inadequate information about land tenure security at plot level diminishes the significance of previous studies. For instance, Do and Iyer (2008) had to rely on the province-level proportion of households with land use certificates as a measure of the probability that a given household would have a land use certificate. Deininger and Jin (2008) used the share of cultivated land in the village to which households had a long-term land certificate as a measure of land

tenure security. These proxies not only suffer from aggregation bias but are also incomplete measures of the assurance, duration and breadth of rights that define tenure security (Place, Roth and Hazell, 1994). As land tenure security and transaction costs play important roles in the functioning of cropland markets and incentives to invest in agriculture (Besley, 1995; Lyne and Thomson, 1998), a study conducted with better information about the status of household land tenure security is expected to give a more accurate picture of transaction costs and their impact on the cropland rental market.

In view of the basic research hypothesis and given that empirical evidence on factors that impede or promote the operation of the cropland rental market in Vietnam remains limited, this study seeks to address the following questions:

(1) What are the patterns and trends in the cropland rental market in rural Vietnam?
(2) Willa more efficient rental market for cropland help to improve farm efficiency, incomes and equity in rural Vietnam?
(3) What impact do household endowments have on the motive for participating in the cropland rental market in rural Vietnam?
(4) To what extent do transaction costs prevent rural households from participating in the cropland rental market in rural Vietnam?

Deininger and Jin (2005) emphasise that much of the past international literature was critical of rental transactions in situations of unequal access to land between large owners and small tenants or landless workers. In the context of rural Vietnam, where virtually all households have access to cropland and farm sizes are uniformly small, alleviating problems that prevent the efficient operation of farmland rental markets could make a significant contribution to both agricultural productivity and equity in rural incomes, and lessons learnt could be valuable for other developing and transition countries with similar characteristics.

### 1.2.3 Research Objectives

This study examines the efficiency and equity impacts of the cropland rental market in rural Vietnam and the efficiency of the rental market itself. The main data sources used in

the study are household-level data from Vietnam Household Living Standards Surveys (VHLSS) spanning the period 2004-2008.

In view of the research questions identified, the overarching objective of this study is to examine the efficiency of the rental market for cropland and its role in alleviating poverty in Vietnam. Specific objectives are (*i*) to gain a better understanding of factors affecting farming household participation in rental markets for cropland in rural Vietnam; (*ii*) to empirically explore relationships between farm efficiency, income, equity and rental market transactions in rural Vietnam; (*iii*) to enrich the empirical literature on cropland rental markets in transition countries; and (*iv*) to inform land reform policy in Vietnam.

## 1.3 Significance of the Thesis

Transition economies like Vietnam provide a unique opportunity to study the development of cropland markets as land reforms have reallocated property rights and liberalised land exchange restrictions. This study contributes to the existing body of cropland rental market literature in several aspects. First, an analytical framework is developed to gain a better understanding of how policy, tenure security, cropland rental markets and agricultural productivity are related by analysing the mechanisms that link them together. Despite its importance, such theoretical constructs have often been by-passed in previous empirical studies. Second, using a formal theoretical model and associated econometric analyses, this study adds to the existing body of literature by providing further evidence on the development of cropland markets and their determinants that is still scarce in the literature. Third, although there have been some attempts to examine the effects of transaction costs and land tenure security on cropland rental market participation and investment incentives in rural Vietnam, these studies were constrained by inadequate information. This study has the advantage of large samples drawn over time to gain a better understanding of transaction costs and their impact on the rental market for cropland. As far as the author was aware, no previous studies had attempted to measure and test for asymmetric transaction costs in a land rental market. Fourth, Vietnam remains a substantially under-researched country and this study is the first attempt to measure

responses in cropland markets since the 2003 Land Law was passed. Finally, in the context of rural Vietnam, where virtually all households have access to cropland and farm sizes are uniformly small, alleviating problems that prevent the efficient operation of farmland rental markets could make a significant contribution to agricultural productivity with equitable gains in rural incomes, and lessons learnt could be valuable for other developing and transition countries with similar characteristics.

## 1.4 Organisation of the Thesis

This thesis comprises seven chapters. Following this introductory chapter, Chapter 2 reviews the agricultural reform in Vietnam, recent concerns over low farm productivity and incomes, and the role of new technology in raising farm productivity. It then presents evidence of small farm size and land fragmentation in Vietnam and explains why this problem discourages farmers from adopting new farm technology. Motives for participating in cropland markets are reviewed, and the advantages of a land rental market over a land sale market are discussed. Attention is then given to the determinants of an efficient land rental market, and the chapter concludes with evidence of inefficiencies in Vietnam's rental market for cropland.

Chapter 3 introduces a conceptual framework that links policies, tenure security, transaction costs, cropland rental markets and agricultural productivity. A theoretical model is then proposed to explain rural household participation in the cropland rental market subject to transaction costs, and testable research hypotheses are drawn from this theoretical framework.

Chapters 4 to 6 present the results of empirical analyses. Chapter 4 describes the data sources used in the thesis, and defines and classifies populations and sub-populations of interest. The chapter then reports and analyses relevant descriptive statistics computed from the VHLSS sample data.

Chapter 5 explains the performance of farming households and examines the effect of cropland rental market participation on this performance. A stochastic frontier model is employed for this purpose.

Chapter 6 is concerned with identifying and understanding transaction costs that affect participation in, and hence the efficiency of, Vietnam's cropland rental market. To achieve these goals, a generalised ordered logit model that allows market participation thresholds to vary with transaction costs is developed and estimated.

Chapter 7 draws conclusions from the empirical findings and offers recommendations for policy and practice. The chapter ends with a discussion of limitations encountered in the study and suggestions for future research.

## 1.5 Chapter Summary

Chapter 1 identifies the research problem, explains its importance and sets out the research objectives and questions that this study intends to address. It also discusses the contribution of the thesis to existing knowledge and describes the structure of the thesis.

In order to understand relationships between low farm incomes, small farm size, land fragmentation and the roles of an efficient cropland rental market, it is important to carefully examine current facts, economic theory and the existing literature. Chapter 2 starts this examination by reviewing and appraising literature relevant to the origins of, and potential solutions to, the problem of low farm incomes in rural Vietnam.

# Chapter 2

# Literature Review

**This chapter**

* reviews agricultural reforms, recent concerns over low farm productivity and incomes in Vietnam, and the role of technology and information in raising farm productivity;
* shows evidence of small farm size and land fragmentation in Vietnam and explain why this problem discourages farmers from adopting new farm technology;
* considers motives for participating in cropland markets;
* explains the advantages of a land rental market over a land sale market; and
* examines the determinants of an efficient cropland rental market and presents evidence of inefficiencies in Vietnam's rental market for cropland.

## 2.1 Low Farm Incomes and Poverty in Rural Vietnam

### 2.1.1 Agricultural Reform and Achievements

In 1985, Vietnam was one of the five poorest countries in the world, and there was little indication that Vietnamese households had any hope of raising their level of welfare (Glewwe, Agrawal, and Dollar, 2004). In 1986, beginning with a wide-ranging set of policy changes collectively known as *Doi Moi*, Vietnam engaged in important institutional reforms aimed at shifting its centrally planned economy to a market-oriented system. Continuing through the 1990s, Vietnam transformed itself into one of the most successful countries in the developing world in terms of economic growth, poverty reduction and increased household welfare. Impressive economic growth was recorded during the 1990s, with real annual growth averaging 7.5 per cent (WB, 2006a). In 1993, 58 per cent of the population lived in poverty and the estimate declined to 19.5 per cent in 2004 (VASS, 2007; WB, 2006a).

In the agricultural sector, reforms were designed to strengthen farming households' decision making capacity as a way to boost agricultural production. Decollectivisation and allocation of cropland to rural households, removal of price controls and other barriers to agricultural production, and liberalisation of agricultural trade benefited the vast majority of the population, particularly the rural poor (Glewwe *et al.*, 2004) . These changes lifted Vietnam from a net food importer in 1985 to the world's third largest rice exporter by 1992 (Glewwe *et al.*, 2004). The real annual rate of agricultural growth averaged 4.2 per cent during the period 1990-2003 (FAO, 2006).

Agricultural land reforms were one of the most important contributors to Vietnam's rapid growth and poverty reduction (WB, 2006a). Land rights over cropland in Vietnam have evolved dramatically since the 1988 Land Law, which mandated the break-up of agricultural collectives. Cropland in collective farms was allocated to households for a duration of 10-15 years. The process of identifying users and allocating certificates was managed in a decentralised way with equity as a primary consideration (WB, 2002). Although the land allocation process varied between regions, the distribution of cropland to households was both efficient and egalitarian (Deininger and Jin, 2008; WB, 2003). Since land remained the property of the State (or 'belongs to the People', according to the Constitution), household heads were initially assigned rights to use land but not to dispose of it by way of renting or selling (1988 Land Law). Without rights to transfer land, however, farmland markets did not develop apart from some informal transactions (Do and Iyer 2008). To make up for this deficiency, the 1993 Land Law introduced official titles and permitted land transactions. Although land remained the property of the State, land use rights could now be legally transferred, exchanged, mortgaged, leased and inherited. In addition, the 1993 Land Law extended the duration of rights to 20 years for annual cropland and to 50 years for perennial cropland. While there was no denying that these newly assigned land rights unleashed farmers' incentives to invest and put more effort into farming, more remained to be done in order to achieve higher levels of efficiency in land use (Do and Iyer 2008). The 2003 Land Law was an additional step towards this end. This law streamlined land administration, expanded the bundle of land rights to include sub-letting, and attempted to create a favourable environment for the

development of land markets. Provision was also made for more land to be titled. A subsequent revision of the Land Law in 2004 made an important contribution to gender balance by registering the names of both the husband and wife on land use certificates (WB, 2008).

In the early stage of transition, the egalitarian transfer of assured land use rights resulted in pro-poor growth, i.e. economic growth with equity and poverty reduction (Deininger and Squire, 1998; Ravallion and van de Walle, 2001). The egalitarian nature of land reform created a social safety net for the rural poor whose livelihoods were closely linked to subsistence agriculture. Improved tenure security encouraged small farming households, who accounted for the bulk of Vietnam's poor, to increase their farm output by applying more labour - their most abundant input. Evidence of the labour intensification included gains in agricultural production achieved with only modest growth in the use of market inputs and with little or no technological change (Che, Kompas and Vousden, 2006; Kompas, 2004). Labour intensification on a multitude of small family farms not only helped to contain rural-urban migration, but also supported (demand-led) growth in the rural non-farm economy (Hazell, Poulton, Wiggins and Dorward, 2007). This farm and non-farm growth combined to lift most of Vietnam's poor out of poverty and food insecurity in the 1990s and early 2000s (Minot *et al.*, 2006; van de Walle and Cratty, 2004).

### 2.1.2 Challenges: Low Farm Incomes and Inequality

Although economic growth and poverty reduction in response to market-oriented policy reforms have been impressive, there are concerns that the reforms have not produced institutions strong enough to support efficient markets in all sectors of the economy, and that economic growth has slowed (Gaiha and Thapa, 2007; Hansen and Diaz, 2008; Joint-Donors, 2009). Agricultural growth rates started to fall after 2000 and the sector's share of the economy declined dramatically despite disappointing levels of rural industrialisation (Gaiha and Thapa, 2007; Joint-Donors, 2009). Table 2.1 illustrates some of these points by presenting key indicators of Vietnam's economy in recent decades.

**Table 2.1 Key indicators of Vietnam's economy, 1990-2009**

| Indicators | 1990-94 | 1995-99 | 2000-04 | 2005-09[a] |
|---|---|---|---|---|
| GDP growth rate per annum (%) | 7.8 | 7.0 | 7.3 | 7.1 |
| Output growth rate of agriculture [b] per annum (%) | 3.9 | 4.4 | 3.8 | 3.4 |
| Share of agriculture in total GDP using 1994 fixed price (%) | 29.8 | 24.6 | 21.8 | 18.2 |
| Share of agriculture in total employment [c] (%) | n.a. | n.a. | 61.1 | 53.5 |

Source: Vietnam General Statistics Office, (2007b, 2008, 2009b).

Note: [a] The figures of 2009 are preliminary.
[b] Forestry and fisheries are also included in agriculture sector.
[c] Total employment is defined as the employed population aged 15 years or older on 1 July, excluding security and defence forces.

There was a sustained increase in agricultural growth from 1988, when collective farming was effectively abolished, until 2000. Since then, annual growth has continued to fall. Furthermore, agriculture's share of the country's labour force has remained relatively high (55% in the late 2000s) although there has been a sharp decline in its share of total GDP (from 30% in the early 1990s to 18% in the late 2000s) suggesting that the productivity of farm labour has remained low. According to the World Bank (WB, 2009), returns to farm labour amounted to less than one-half of national labour productivity in 2005 and ranked Vietnam in a group of 20 countries with the lowest agricultural labour productivity in the world.

Low productivity translates into low returns to farm labour. Wages are very low in most parts of rural Vietnam and rural households that engage only in farming are the poorest (VASS, 2007). Recent estimates of Vietnam's economic development show that about 48 per cent of the population lived on less than US$2 a day in 2006, and Vietnam remains one of the 40 lowest-income countries in the world (WB, 2009). Table 2.2 presents estimates of consumption expenditure, income and sources of income in rural and urban Vietnam over the period 2002-2006.

**Table 2.2 Rural-urban income and consumption expenditure per capita, 2002-2006**

| Indicators | Rural area | | | Urban area | | |
|---|---|---|---|---|---|---|
| | 2002 | 2004 | 2006 | 2002 | 2004 | 2006 |
| Monthly income per capita (USD) [a] | 20.9 | 25.9 | 29.8 | 47.3 | 55.8 | 62.3 |
| Income sources (%) | | | | | | |
| Agriculture | 36.0 | 35.0 | 33.0 | 23.1 | 22.6 | 20.7 |
| Forestry | 2.0 | 1.6 | 1.3 | 1.3 | 1.0 | 0.8 |
| Fishery | 5.4 | 5.3 | 5.1 | 4.1 | 3.6 | 3.3 |
| Salary/wage | 24.8 | 26.0 | 27.7 | 32.7 | 32.7 | 34.3 |
| Self employed | 12.5 | 12.3 | 12.4 | 17.1 | 17.1 | 17.3 |
| Others | 14.0 | 14.4 | 15.4 | 16.2 | 17.7 | 18.1 |
| Monthly consumption expenditure per capita (US$)[a] | 17.7 | 21.5 | 23.6 | 37.8 | 44.6 | 47.8 |
| Poverty rate by expenditure[b] | 35.6 | 25.0 | 20.4 | 6.6 | 3.6 | 3.9 |

Source*:* Vietnam General Statistics Office, (2009a).

Note: [a] The estimates are in 2006 price, 1USD is about 17,000 VNDs in 2006.
[b] The poverty rate is the headcount incidence of people with per capita expenditure below a defined poverty line. The general poverty lines provided by the GSO and the WB for monthly average expenditure per capita for different years are as follows: 160,000 VNDs in 2002; 173,000 VNDs in 2004; and 213,000 VNDs in 2006.

Agricultural income still accounts for about one-third of rural household income, and is therefore a major contributor to low per capita incomes. Per capita income and consumption in rural households are less than one-half of the levels observed in urban households. Moreover, this gap has been widening over time suggesting that persistent low productivity of farm labour is one of the main causes of increasing inequality between rural and urban incomes. As a result, the poorest people are located predominantly in rural areas and depend heavily on agriculture. Increasing the productivity of farm labour would therefore help to improve living standards, alleviate rural poverty and narrow income inequality between rural and urban Vietnam.

Increased farm income has a multiplier effect on the rural economy as the demand for locally produced, non-tradable goods and services grows (Delgado, Hopkins and Kelly, 1998; Hendriks and Lyne, 2003). Several studies have measured the size of these rural growth multipliers. For example, Hendriks and Lyne (2003) report a gross growth multiplier of 1.28 for their sample of poor rural households in KwaZulu-Natal, South Africa. This suggests that US$1 added to household incomes would grow to US$1.28 as a

result of increased spending on demand-constrained, non-tradable goods and services. In Asia, estimates of growth multipliers range from 1.46 to 1.83, suggesting strong links between agriculture and the rural non-farm economy (Delgado *et al.*, 1998).

### 2.1.3 The Importance of New Agricultural Technology

Hendriks and Lyne (2003) point out, however, that the growth multiplier only indicates the potential to stimulate rural economic growth and that while potential growth linkages are driven by non-tradable goods and services, these non-tradables themselves are unlikely to generate the initial income shock. In rural areas, where most households have farm labour, access to some land and knowledge of farming, the commodities most likely to provide the initial income shock are traditional farm exports (Delgado *et al.*, 1998). Increased production of tradable farm commodities could come from new agricultural technology, improvements in infrastructure, or economies of scale in marketing (Delgado *et al.*, 1998; Hendriks and Lyne, 2003).

Advanced agricultural technology has been the most important driver of improvements in agricultural productivity and agricultural output over the past fifty years, particularly in countries well-endowed with natural agricultural resources (Southgate, Graham and Tweenten, 2006). In developing countries, for example, 69 per cent of overall growth in food production during the 1970s and 1980s was attributed to yield increases; extensification was responsible for just 31 per cent (Southgate *et al.*, 2006). Thanks to the Green Revolution that provided high-yielding crop varieties, cereal production in Asia doubled while the total land area cultivated with cereals increased by only four per cent between 1970 and 1995 (Hazell, 2002). As a result, cereal availability per person increased by nearly 30 per cent in Asia (Hazell, 2002). The Green Revolution not only increased farmer incomes, rural employment and rural wages, but also reduced the price of staple foods (Hazell, 2002; Southgate *et al.*, 2006).

There are many factors that influence the adoption of new agricultural technology, but the most fundamental of these is profitability. Section 2.2.2 highlights these factors but concentrates on the relationship between profitability and farm size. In particular it

explains why adoption is inhibited by very small farm sizes, even when the technology itself is highly divisible and scale neutral.

## 2.2 Constraints to Farm Incomes: Small Farms and Land Fragmentation

### 2.2.1 Small Farm Size and Land Fragmentation in Vietnam

Land reforms left Vietnam with very small farms. As mentioned previously, one of the key features of land reform was its egalitarian nature although the land allocation process varied between regions. The aim of the egalitarian land reform was to maintain equality and to avoid conflicts over land distribution during the break-up of collective fields. Land reform gave all rural households that wanted to farm the right to access land (1993, 2003 Land Laws). In most cases, local rural authorities specified a certain amount of agricultural land per capita (measured in adult equivalents) and allocated land to households primarily according their number of adult equivalents (WB, 2002). Other factors, like land quality, the irrigation system, distance to plots and social policies, were also taken into account in the allocation process. For example, the quality of land used to produce annual crops was divided into six categories and, in order to maintain equality, each household was allocated plots in these different categories. As a result, the small farms were severely fragmented (Marsh *et al.*, 2006).

Recent data show that approximately 73 per cent of Vietnam's 85 million people live in rural areas, and the agricultural labour force accounts for about 54 per cent of the country's total labour force (GSO, 2009b). Only 9.4 million hectares (28.5% total area) are suited to arable farming, of which 6.1 million hectares were allocated to 9.7 million farming households, accounting for 70.3 per cent of the total rural population (GSO, 2007a). In 2006, the average farm size in Vietnam was just over 0.6 hectares (Table 2.3).

Table 2.3 shows an upward trend in farm size over the period 1993-2006, and a decrease in the number of farming households between 2001 and 2006. While the percentage of farms ranging from 0.5 hectares to one hectare in size has not changed, the share of farms

**Table 2.3 Farm size in Vietnam, 1993-2006: Trend and structure changes**

| Indicators | 1993[a] | 1998[a] | 2001[b] | 2006[b] |
|---|---|---|---|---|
| Farm size | | | | |
| < 0.2 ha (%) | - | - | 25.8 | 24.8 |
| 0.2 -- < 0.5 ha (%) | - | - | 41.3 | 38.8 |
| 0.5 -- < 1 ha (%) | - | - | 17.2 | 17.9 |
| 1 -- < 2 ha (%) | - | - | 10.3 | 11.6 |
| ≥ 2 ha (%) | - | - | 5.4 | 7.0 |
| Average farm size (ha) | 0.36 | 0.51 | 0.56 | 0.63 |
| Number of farming households ('000) | - | - | 10,106.6 | 9,740.1 |

Source*:* Deininger and Jin (2008); Rural and Agricultural Census (GSO, 2007a).

Note: [a,b] The estimates are from Vietnam Household Living Standard Survey and Rural and Agricultural Census, respectively.

smaller than 0.5 hectares has decreased and the share larger than one hectare has increased. Despite the overall increase in average farm size, the mean is still much smaller than those in the Asian region, which range between one and two hectares, and far below the global average of 3.7 hectares per person (Fan and Chan-Kang, 2005).

Farms are not only small but also highly fragmented in Vietnam (as noted in the first paragraph of this section), especially in northern Vietnam. It was estimated that there were about 75 million parcels or plots of agricultural land throughout Vietnam (Hung *et al.*, 2007; Kerkvliet, 2006), ten per cent of which had an area of only 100 square metre or less (Marsh *et al.*, 2006). This implies an average of six to seven parcels per farming household and land losses (of 2.4–4%) between plots (Phuong, 2008). Although these estimates have not been recently updated, they still provide an accurate picture of small farm size and land fragmentation in Vietnam.

### 2.2.2 Farm Size and the Adoption of New Farm Technology

Adopting new agricultural technologies, as mentioned in the previous section, is essential to raise agricultural productivity, and hence rural incomes. While the adoption of new

technologies is driven by many factors, the role of farm size has taken centre stage in international literature (Feder, Just and Zilberman, 1985; Perrin and Winkelmann, 1976; Welch, 1978). The relationship between farm size and adoption depends on factors such as the divisibility of the technology and its related information and transaction costs, and is conditioned by human capital, risk preferences, land tenure arrangements and credit constraints (Feder *et al.*, 1985; Sunding and Zilberman, 2001).

Costs of adoption that are independent of the intended scale of operation are often overlooked as an impediment to the adoption of new agricultural technologies, including highly divisible ones, by small farmers (Feder *et al.*, 1985; Perrin and Winkelmann, 1976; Welch, 1978). Some of these fixed costs relate to the time and money expended gathering and evaluating information about a new technology and learning how to use it (Perrin and Winkelmann, 1976; Welch, 1978). Others are *ex ante* transaction costs incurred searching for sellers and buyers, and in negotiating contracts (Perrin and Winkelmann, 1976). Lumpy technologies often require debt finance and this adds to the level of fixed transaction costs as farmers have to search for lenders and apply for loans (Feder and O'Mara, 1981; Sunding and Zilberman, 2001). Similarly, adopters often have to procure complementary inputs to support their new technology. For example, high yielding varieties (HYVs) may require inorganic fertilisers and pesticides not previously used. Again, the farmer incurs fixed transaction costs, and these could be substantial where distribution channels are not yet well organised (Feder and O'Mara, 1981; Sunding and Zilberman, 2001). If the new technology involves a shift to more discerning product markets that value safe, ethical and environmentally friendly food, farmers will also confront higher fixed compliance costs like audit fees.

When farms are very small, these fixed information and transaction costs introduce pronounced economies of size and hence a scale bias in the adoption process - even if the technology itself is highly divisible and supposedly scale neutral. Hence, the time pattern, rate and extent of adoption of new agricultural technologies are positively influenced by farm size (Feder *et al.*, 1985; Welch, 1978). This scale bias grows as farming becomes more knowledge intensive and as markets become more discerning, requiring larger

investments in information, education and compliance (Hazell, 2005). It is important to appreciate that size economies benefit the larger farmer not only in terms of lower unit cost, but also in terms of higher revenue, as revenue is proportional to size (Welch, 1978). Thus new technology offers higher net returns to the adopter on a large farm than to the same adopter on a very small farm.

Table 2.4 compares the competitive advantages of small and large farms in terms of transaction costs. According to Poulton, Dorward and Kydd (2005), small farms' competitive advantages over large farms lie mainly in their low transaction costs in accessing and supervising family labour and in their intensive local knowledge. Otherwise, small farms face higher unit transaction costs in almost all non-labour transactions, including access to capital, to market and technical information, to inputs and output markets, and provision of product traceability and quality assurance. Furthermore, the small farm advantage of using family labour diminishes as the economy grows and diversifies into non-farm sectors (Hazell *et al.*, 2007) because wages paid in the off-farm labour market establish an opportunity cost for family farm labour. Besides, it is questionable whether family labour is any cheaper to supervise than is hired labour.

**Table 2.4 Transaction cost advantages of small and large farms**

| Items | Transaction advantages | |
|---|---|---|
| | **Small-farm** | **Large-farm** |
| Unskilled labour supervision, motivation, etc. | x | |
| Local knowledge | x | |
| Food purchase and risk (subsistence) | x | |
| Market knowledge | | x |
| Technical knowledge | | x |
| Skilled labour | | x |
| Inputs purchase | | x |
| Finance and capital | | x |
| Land | | x |
| Output markets | | x |
| Product traceability and quality assurance | | x |
| Risk management | | x |

Source: Poulton, Dorward, and Kydd (2005, p. 224).

In short, the arguments presented in this section suggest that the very small farm sizes that characterise agriculture in Vietnam discourage the adoption of productivity enhancing technology and hence improvements in rural incomes. Since agricultural growth is still the main driver of poverty reduction in Vietnam (Joint-Donors, 2009), facilitating land consolidation and increasing farm size is an important strategy for rural development.

## 2.3 Motives for Participating in Cropland Markets

The common reason for rural households participating in cropland markets is to correct the imbalances in factors of agricultural production at farm level, given their existing endowments of land (Deininger and Jin, 2008; Teklu and Lemi, 2004). When there are significant scale economies in agricultural production or imperfections (or distortions) in markets for agricultural production factors, there exists an optimal operational farm size that may not correspond to current household land endowments (Binswanger, Deininger and Feder, 1995; Sadoulet, Murgai and de Janvry, 2001). For example, the fixed information and transaction costs of adopting new agricultural technologies introduce pronounced economies of size to very small farms like those in Vietnam and hence a scale bias in the adoption process, creating incentives to rent in land. In another context, the advantage of labour supervision of small farms that mainly utilise family labour may be overshadowed by, for instance, imperfections in risk and credit markets (Deininger and Jin, 2008; Sadoulet *et al.*, 2001). By participating in the land rental market, say under sharecropping arrangements, those farms may overcome the factor market constraints through interlinked contracts (Bardhan, 1989). In the Asian context, complementary contracts between landlord and tenant, such as credit and insurance transactions, are commonly observed (Otsuka *et al.*, 1992). A study on kinship networks in land rental markets in the Philippines by Sadoulet, de Janvry and Fukui (1997) confirms the presence of interlinked contracts. Sharecropping arrangements in Vietnam are also reported in Deininger and Jin's (2008) work.

Other reasons for participating in agricultural land markets include the inadequacies of the administratively based land distribution system (Teklu and Lemi, 2004), land

fragmentation (Mearns, 1999; Sikor, Müller and Stahl, 2009), seasonality and shocks (Fabiosa *et al.*, 2004; RodriIguez-Meza, Southgate and Gonzalez-Vega, 2004), changes in the demographic structure and non-agricultural demand for land (Deininger, Ali and Alemu, 2008), and the emergence of non-farm labour markets (Kung, 2002).

As a result, voluntary land transactions play an important role by providing land access to those who are productive but own little land, facilitating exchange of land as the non-farm economy develops, and improving access to credit by using land as collateral where the conditions for doing so exist (de Janvry, Platteau, Gordillo and Sadoulet, 2001; Deininger and Feder, 2001). However, the form of land transfer matters. While both land sales and land rental markets permit these transactions, there are reasons that the land sales market is less attractive, particularly for poor households.

## 2.4 The Advantages of an Efficient Rental Market for Cropland

### 2.4.1 Efficiency and Equity Problems in Land Sale Markets

Theoretically, if all markets functioned perfectly, there would be indifference between renting and buying land: buyers would pay interest on loans to banks, and lessees would pay equivalent amounts of rent to lessors (Sadoulet *et al.*, 2001). In reality, however, "transaction costs …, risk and portfolio considerations, limited access to credit markets, and the immobility of land all imply that the actual performance of land sales markets may be far from the theoretical ideal" (Deininger, 2003, p.94).

A significant impediment to the efficiency of farmland sale markets is that failures in other markets cause landowners to seek premiums that raise land prices above the capitalised value of the land's agricultural income stream (Binswanger *et al.*, 1995). This ownership-generated premium stems from the value of land as collateral for credit, a source of food security and self-employment, a good repository of wealth, a source of insurance, and a way to access credit subsidies, among others (Binswanger *et al.*, 1995; Deininger, 2003; Sadoulet *et al.*, 2001). In periods of macroeconomic instability,

agricultural land may be purchased and held by non-agricultural investors as an asset to hedge against inflation. This adds an inflation premium into the real land price (Binswanger *et al.*, 1995). In other situations where confidence in money as a repository of value is low or financial markets do not work well, land may be used to store wealth and acquired for speculative purposes (Deininger, 2003; Sadoulet *et al.*, 2001). Consequently, the capitalised stream of agricultural income generated from land tends to be lower than the purchase price paid for land. In other words, apart from the expected return from farming, the sale market price may also be affected by the shadow price of capital, the discount rate, and expectations about future returns from farm production and from other uses of land (Deininger, 2003).

Another disadvantage of the land sale market relative to the land rental market is that land purchase typically requires a large outlay that has to be financed out of the farmer's own savings if credit markets function poorly (Binswanger *et al.*, 1995). With constrained access to credit, land purchase ties up scarce capital and further reduces the ability of a poor farmer to finance investments in farm technology, equipment and other inputs (Swinnen, Vranken and Stanley, 2006). On the other hand, a farming household that relies on a mortgage-based land purchase has to forgo the use of land as collateral to access credit since this land is already fully mortgaged. For these reasons, poor but efficient farmers may be unable to participate on the demand side of the land sale market.

On the supply side of land sale markets, poor farming households may be forced into distress sales of land to smooth consumption during shocks or economic hardships where insurance and capital markets function poorly or there is lack of access to social protection (Binswanger *et al.*, 1995; Cain, 1981). The impact of distress sales is aggravated by the phenomenon of high covariation in rural incomes as these sales tend to take place at low prices in bad crop years when a large number of poor farmers are forced to sell land (Binswanger *et al.*, 1995; Deininger, 2003). A land sale market can therefore contribute to a burgeoning 'landless class' of destitute households.

Owing to these problems, land sale markets are unlikely to bring a skewed distribution of owned land holdings to an optimal distribution of operational farm sizes. The implication is that a land sale market will not necessarily transfer land to the most effective farmers when imperfections exist in other markets or the land market itself is affected by policy distortions (Binswanger *et al.*, 1995; Deininger and Feder, 2001). In addition, distress sales of can lead to a politically unacceptable situation where poor households lose their main source of livelihood and food security by creating a very poor landless class. In short, land sale markets do not promise either efficiency or equity.

### 2.4.2 The Advantages of an Efficient Land Rental Market

In comparison with land sale markets, existing literature suggests that voluntary transactions in land rental markets have both efficiency and equity advantages (Crookes and Lyne, 2003). In the presence of an efficient land rental market, underutilised and idle farmland imposes an opportunity cost on the landholder (Lyne and Nieuwoudt, 1991). If the landholder is unable to match this cost, he or she will have an incentive to rent the land to other farmers who can farm it more profitably. In this way, land rental markets not only improve allocative efficiency (Lyne and Nieuwoudt, 1991) but also allow rural households to test farming and non-farming livelihoods without alienating land or moving their homes (de Janvry *et al.*, 2001). In addition, the rental market allows farmers to exchange and consolidate fragmented land parcels and hence improve their cost efficiency (Hung *et al.*, 2007; Norton, 2004).

In contrast to the land sale market in situations where other markets are imperfect, the rental market for agricultural land can go a long way towards optimising the distribution of operational farm sizes at relatively low (transaction) cost (Deininger, 2003; Sadoulet *et al.*, 2001). Perhaps even more important than these static efficiency gains, as Kille and Lyne (1993) point out, the land rental market allows more effective farmers to grow the operational scale of their farms over time, making investments in knowledge and new technology more profitable (as returns to new technology increase with farm size while unit costs of information and adoption decrease). These efficiency gains may further translate into higher levels of output and better employment opportunities on farms and in

service industries (e.g., marketing, transport and processing) (Deininger and Jin, 2005; Vranken and Swinnen, 2006).

In addition, the land rental market, with an accompanying set of contractual arrangements, enables lessees and lessors to overcome imperfections in markets for credit, insurance, labour and machinery services (Bardhan, 1989; Otsuka *et al.*, 1992; Sadoulet *et al.*, 2001). For instance, where credit markets function poorly, share tenancy may help to overcome a limit on the working capital available to the lessee through cost-sharing arrangements (Bardhan, 1989; Binswanger *et al.*, 1995; Otsuka, 2007; Otsuka *et al.*, 1992). Likewise, share tenancy can alleviate problems associated with missing or imperfect markets for inputs such as management, machinery, draught power and captive family by pooling the resources of the lessee and lessor (Otsuka, 2007; Sadoulet *et al.*, 2001). It can also alleviate problems associated with missing or imperfect insurance markets by shifting some of the yield and price risk from lessees to lessors (Binswanger *et al.*, 1995; de Janvry *et al.*, 2001; Otsuka, 2007).

Viewed from an equity perspective, a rental market offers benefits to both lessees and lessors without creating distress sales and a 'landless class' problem (Crookes and Lyne, 2003). The gains result from a household's voluntary choice between participating in the market or not. Assuming that a household's behaviour is to maximise its utility, then voluntary transactions occur only if the rental transaction creates utility greater than the cost it requires. Furthermore, land rental markets may provide prospective farmers an entry point in accessing land, leading toward land ownership, while also providing lessors with an opportunity to gain experience in non-farm occupations as the economy diversifies with more non-farm jobs available (Crookes and Lyne, 2003; Deininger, 2003; Sadoulet *et al.*, 2001).

In sum, land rental markets are likely to be more effective and friendlier than land sale markets in providing access to land, enhancing allocative efficiency and improving equity where land holdings are uniformly small and fragmented, farmers are poor, and markets for complementary inputs are missing or highly imperfect. These conditions certainly

apply to Vietnam. In addition, Vietnam - despite its bold land reforms - still imposes strict ceilings on land ownership (3 hectare in terms of the 2003 Land Law) so that opportunities for land consolidation and expansion of farm sizes through the land sale market are very limited. This legal restriction on the maximum area of land owned means that the sale market is unlikely to bring about an optimal distribution of operational land sizes. Consequently, an efficient land rental market is essential for Vietnam to achieve higher levels of growth in agriculture and to raise rural incomes with equity.

## 2.5 Efficiency of the Rental Market for Cropland in Vietnam

### 2.5.1 Determinants of an Efficient Land Rental Market

Agricultural land scarcity is the basis for the economic value of land and for the emergence of agricultural land markets (Binswanger *et al.*, 1995; Feder, Onchan, Chalamwong and Hongladarom, 1988). However, land markets will not develop in the absence of secure land tenure and low transaction costs (Lyne and Thomson, 1998). "While you can have land rights without a market, you cannot have a market without land rights" (Wallace and Williamson, 2006, p.128). As one person may hold different rights to a parcel of land, this give rise to the concept of a 'bundle of rights'. A bundle of rights can be understood as the legal or customary collection of rights associated with a land parcel, and quite often, particular rights within the bundle can be acquired in different ways and held by different people for different period (FAO, 2002).

Security of land tenure defined by Place *et al.* (1994) involves three components: breadth, duration, and assurance of land rights. The breadth or robustness of land rights refers to the quantity (or bundle) of rights, such as rights of access, use, exclusion and transfer, under a legal or customary framework assigned to an individual or organisation. Duration of rights means the length of time during which the validity of a specified right or set of rights is legally protected. Assurance of land rights signifies the certainty with which rights and duration are exercised. Accordingly, the term 'tenure insecurity' involves some combination of; (a) insufficient number of absolute rights, (b) insufficient duration of a

right or a set of rights, (c) inadequate assurance in exerting rights, and (d) high costs of enforcing and maintaining rights (Place *et al.*, 1994).

This definition signals an inverse relationship between security of tenure and transaction costs in land rental markets (Lyne 2009; Lyne, Roth and Troutt, 1997). In the case of inadequate breadth of rights, for example, a potential lessee may be faced with prohibitively high transaction costs of discovering the owner of a land parcel and establishing a contract if there are many legitimate claimants with inclusive rights to the parcel. Risks that arise from inadequate assurance of land rights can also be viewed as a source of transaction costs (Lyne *et al.*, 1997). Examples of risks stemming from inadequate assurance of rights include uncertainty about institutions to resolve disputes, complex and costly procedures to establish or defend contracts, or unpredictable judgements (Lyne *et al.*, 1997). All of these reduce land tenure security and raise transaction costs.

Transaction costs, in turn, can be divided into fixed and variable (or proportional) components (Goetz, 1992; Key, Sadoulet and de Janvry, 2000; Skoufias, 1995). As suggested by the names, fixed transaction costs in land rental markets are those costs invariant to the quantity of land transacted and affecting a farming household's market participation behaviour (Key *et al.*, 2000; Skoufias, 1995). Fixed transaction costs in land rental markets may include the costs of searching, obtaining and screening information about markets, partners, and location and quality of land; negotiating and bargaining for the best price, and drafting a contract (Skoufias, 1995). Hence, fixed transaction costs tend to rise when physical infrastructure is poor (specifically roads and telecommunications) (Lyne, 2009); accessing necessary documents or securing approval from local officials is time-wasting and costly; or the legal fees of notary and registration of land transfer are high (de Janvry *et al.*, 2001). Variable transactions costs, on the other hand, vary with the quantity of land traded. These costs may include monitoring and enforcing rental agreements and profits lost from shirking and imperfect supervision (e.g. lessees may deplete the fertility of the soil) that arise from the opportunistic behaviour of lessees or lessors or both (Skoufias, 1995). Transaction costs can also be usefully divided into *ex*

*ante* and *ex post* components (Williamson, 1985). *Ex ante* transaction costs are mainly fixed costs associated with costs of searching for markets and partners, drafting, negotiating and safeguarding contracts while the costs of monitoring, renegotiating and enforcing contracts, and losses or risk of losses caused by cheating and shirking belong to the *ex post* component that are mainly variable costs (Lyne, 2009).

Transaction costs effectively drive a wedge between potential lessees and lessors: these costs tend to lower the price offered by the potential lessee while raising the potential lessor's reserve price, creating a 'price band' in land rental markets and excluding those within the band who find it unprofitable to participate (Crookes and Lyne, 2003; Key *et al.*, 2000). Related to land tenure security, *ex ante* transaction costs tend to increase if breadth and duration components of land rights are inadequate, removing households with only small areas of land from the rental market (Crookes and Lyne, 2003). As a result, when land is highly fragmented, as in Vietnam, potential market participants will face pronounced unit *ex ante* transaction costs. In the case of prohibitively high *ex ante* fixed transaction costs, the costs preclude contracting and are therefore unobservable (Crookes and Lyne, 2003). With regard to the assurance of rights, *ex post* transaction costs tend to increase if statutory or customary institutions do not assure land rights and their duration (Crookes and Lyne, 2003). An increase in *ex post* transaction costs tends to reduce the quantity of land transacted as they are largely variable costs. It follows that insecure tenure and high transaction costs prevent land rental markets from functioning efficiently.

### 2.5.2 Evidence of an Inefficient Land Rental Market in Vietnam

Although Vietnam has undertaken comprehensive land reforms (including the recent 2003 Land Law) to liberalise agriculture, there is still ample evidence that land rental markets for cropland remain inefficient in many parts of rural Vietnam, constraining agricultural productivity and hence farm incomes. Table 2.5 presents estimates of net income per hectare between dryland and wetland in eight regions of Vietnam in 2002 and 2006.

As can be seen from the table, profits from farming on dryland, on average, are about 30-50 per cent higher than those on wetland in both periods. The differences are highest in

**Table 2.5 Net income from dryland and wetland by region, 2002 and 2006**

| Regions | Net income per hectare in 2002 (USD)[a] | | Net income per hectare in 2006 (USD)[a] | |
|---|---|---|---|---|
| | **Wetland** | **Dryland** | **Wetland** | **Dryland** |
| Red River Delta | 541.2 | 1029.4 | 541.2 | 458.8 |
| North-East | 464.7 | 811.8 | 570.6 | 1123.5 |
| North-West | 405.9 | 682.4 | 417.6 | 635.3 |
| North Central | 441.2 | 582.4 | 470.6 | 747.1 |
| South Central | 394.1 | 341.2 | 358.8 | 558.8 |
| Central Highland | 382.4 | 776.5 | 582.4 | 1064.7 |
| South-East | 270.6 | 576.5 | 358.8 | 500.0 |
| Mekong Delta | 458.8 | 376.5 | 641.2 | 782.4 |
| Whole country | 452.9 | 688.2 | 523.5 | 705.9 |

Source: Computed from the sample data of 2002 and 2006 Vietnam Household Living Standards Surveys.

Note: [a] Estimates are expressed in constant 2006 prices, 1USD = 17,000 VND.

the Central Highland region where net income per hectare of dryland is nearly double that of wetland. This larger profit on dryland versus wetland suggests that there has been little substitution of rice with more profitable crops on wetland. In some areas this may be the result of local zoning regulations that set wetland aside for rice production, and in other areas it may be the result of cumbersome procedures to authorise land transactions or changes in land use, or both.

Although Vietnam has implemented comprehensive land reforms, there is evidence that property rights to farmland are still far from secure when tested against the breadth, duration and assurance components of tenure security. Applying Schlager and Ostrom's (1992) classification of the breadth of rights to agricultural land in Vietnam provide some useful insights. Their classification yields five groups of rights. The right of access enables farming households to enter a defined physical area of land. The right of withdrawal allows farming households to obtain agricultural products from the resource. The right of management gives farming households' authority to determine how and when they use or transform agricultural land. The right of exclusion allows farming households to determine who will be qualified to have rights of access and withdrawal and how these rights may be transferred. Finally, the right of alienation entitles farming households to transfer, exchange or mortgage part or all of the above rights to another individual or group.

Table 2.6 presents the progressive privatisation of such rights for agricultural land in Vietnam over the period 1981-2003. Although the 2003 Land Law extended private control over land, "[l]and belongs to the entire people with the State as the representative owner" and "[t]he State shall uniformly exercise administration of land" (Articles 5 and 6 of the 2003 Land Law). The law has conferred the same bundle of rights to all landholders regardless of their political and social status (2003 Land Law). Furthermore, the law has mandated the establishment of a new specialised agency for land administration whose tasks include measuring, demarcating and registering landholdings and issuing land use rights certificates[1].

It was anticipated that enhanced rights and registration would satisfy household demand for more secure land tenure (Sikor, 2004), and that enhanced tenure security, in turn, would motivate farming households to invest more labour and capital in land. The new 2003 Land Law intended to strengthen these incentives and promote allocative efficiency by allowing subletting and by removing earlier limitations imposed on lease duration (less than or equal to three years in the 1993 Land Law). Furthermore, the extended use of land titles as a mortgage, guarantee or capital share was expected to increase the supply credit to farming households.

Practically, however, the literature offers evidence of widespread inadequacy in the breadth, duration and assurance of land rights. Recent statistics show that 18 per cent of the country's agricultural land remains uncertified, leaving 1.6 million hectares without security of land tenure in 2007 (Phuong, 2008). This problem is most severe in the South Central Coast and Central Highland regions, where approximately 31 per cent and 39 per cent of the land respectively is not certified (Phuong, 2008). In addition, the powers of local government officials reduce the user's rights of management and exclusion (Sikor, 2004). For example, local authorities can prevent farmers from planting wetland to crops other than rice (Article 36 of the 2003 Land Law). There is evidence that the share of the

[1] This specialised agency was established under the 1993 Land Law but further emphasised in the 2003 Land Law. In the past, most agricultural land administration had been the responsibility of cooperatives.

**Table 2.6 Progressive privatisation of agricultural land rights, 1981-2003**

| | Directive 100 (1981) | Resolution 10, 1988 Land Law | 1993 Land Law | 2003 Land Law |
|---|---|---|---|---|
| **Land title** | No | Initially issued | Partly | Incomplete |
| **The right of access** | Yes | Yes | Yes | Yes |
| **The right of withdrawal** | | | | |
| Farm outputs | Limited | Yes | Yes | Yes |
| Compensation when the State recovers land | No | No | Partly | Yes |
| **The right of management** | | | | |
| Management of agricultural production process | | | | |
| Soil preparation | No | Partly | Yes | Yes |
| Seed breeding | No | Partly | Yes | Yes |
| Planting, caretaking, harvest | Yes | Yes | Yes | Yes |
| Crop protection | No | Partly | Yes | Yes |
| Pest control | No | Partly | Yes | Yes |
| Irrigation | No | No | Partly | Partly |
| Conversion of wetland for rice into other uses | No | No | Restricted | Restricted |
| **The right of exclusion** | | | | |
| (Specifically wetland) | No | Partly | Partly | Partly |
| **The right of alienation** | | | | |
| Transfer (sale) | No | No | Restricted | Yes |
| Exchange | No | No | Yes | Yes |
| Lease | No | No | Restricted | Yes |
| Sublease | No | No | No | Yes |
| Mortgage, guarantee and capital share | No | No | Mortgage | Yes |
| Bequest | No | No | Yes | Yes |
| **Duration** | | | | |
| Cropland | Annually | 10 years | 20 years | 20 years |

Source: Directive 100 (1981), Resolution 10 (1988), 1988, 1993 and 2003 Land Laws.

cropped area devoted to perennial crops has been increasing (Akram-Lodhi, 2004; Do and Iyer, 2008). This suggests that restrictions on the conversion of annual land into perennial land, as in the case of wetland rice, are preventing allocative efficiency. The claim is supported by Markussen *et al's.* (2011) finding that, at plot level, about 36 per cent of sampled plots 'must grow rice in all seasons' despite the user's preference for other crops. The right of exclusion is further weakened when land allocation maps do not show individual parcels of wet rice land as in the case of Son La province (Sikor, 2004) and Thua Thien Hue province (Smith, Williamson, Burns *et al.,* 2007).

Not only is the breadth of land rights inadequate, but also the duration of land rights is limited. According to the 2003 Land Law, the right to annual land cultivated to annual crops expires after 20 years, and the limit for land growing perennial crops is 50 years. Although land rights certificates may be renewed at the end of the period (the first certificates will expire in 2013), renewal is conditional on an official's assessment that the farmer has complied with the law and will continue use the land for its certified purpose. When making its assessment, local government can (and may have a political incentive to) adjust rights, for instance to maintain farm size equality (Kerkvliet, 2006). Such uncertainty undermines land tenure security, raising transaction costs and reducing farming household incentives to improve land.

Risks stemming from inadequate assurance of land rights are another source of transaction costs. In this sense, laws threatening dispossession if land is used for the wrong purposes, farmed inefficiently or intentionally damaged (Article 38 of the 2003 Land Law) expose certified landholders to opportunistic behaviour on the part of government officials. Huyen and Ha (2009) provide evidence of land disputes that government has been slow to resolve, and of local governments expropriating land 'in the public interest' without offering fair compensation. These risks undermine the new land law as they weaken incentives to invest in agriculture and reduce the volume of land transacted in the rental market.

Excessive land fragmentation, especially in the north, also contributes to high transaction costs. As explained in the previous section, unit transaction costs rise when the plots traded are small. In addition, bureaucratic hurdles make procedures for transferring farmland cumbersome and costly (Smith *et al.*, 2007; WB, 2002). For example, a formal land transaction documented in An Giang province passed through 23 administrative steps (Smith *et al.*, 2007). It is not surprising that informal (illegal), and hence highly personalised, transactions persist (Kerkvliet, 2006; WB, 2002). Poor physical infrastructure, particularly rural roads and telecommunications (Joint-Donors, 2009), also add to transaction costs and inefficiency in land rental markets.

## 2.6 Chapter Summary

This chapter reviewed the roles of a cropland rental market in helping farmers overcome the problem of low farm incomes by invoking economic theory and the existing literature, and showed evidence of an inefficient land rental market in Vietnam. It started with a review of agricultural reforms in Vietnam, recent concerns over the stagnation of agriculture, low farm incomes and income inequality between urban and rural areas. Next, the chapter demonstrated the important and significant roles of new technology in raising farm productivity, and hence farm incomes, and showed how the problem of small farm size and land fragmentation discourages farmers from adopting new farm technology. It then discussed motives for participating in an agricultural land market; and, in this regard the chapter explained why an efficient rental market for cropland is more advantageous to market participants than is a land sale market when farms are uniformly small and farmers are poor. The chapter then elaborated on determinants of an efficient rental market for cropland and showed evidence of an inefficient cropland rental market in Vietnam.

Chapter 3 introduces a conceptual framework that links policies, tenure security, transaction costs, cropland rental markets and agricultural productivity. It then proposes a theoretical model to explain rural household participation in the cropland rental market subject to transaction costs, and draws testable hypotheses from this theoretical framework. Empirical models are introduced in later chapters to address the research questions and test the hypotheses.

# Chapter 3

# Theoretical Framework and Hypotheses

**This chapter**

* introduces a conceptual framework that links government policies, tenure security, transaction costs, land rental markets and agricultural productivity;
* proposes a theoretical model to explain rural household participation in the cropland rental market in the presence of transaction costs; and
* states testable research hypotheses derived from the literature review and results of the theoretical model.

## 3.1 Conceptual Framework

Theoretically, if there are perfect markets for all non-land factors of production then achieving efficiency may not require the cropland rental market to function (Bardhan and Udry, 1999; Pender and Fafchamps, 2006). These non-land factors can be hired in or out by landowners until landowners earn equal marginal products for all factors of production (Binswanger and Rosenzweig, 1986; Pender and Fafchamps, 2006). Tenancy is thus not necessary unless there is some other market imperfection. In reality, smallholders in developing and emerging economies tend to confront missing or highly imperfect markets for insurance, credit and management and contractor services (Binswanger and Rosenzweig, 1986; Sadoulet *et al.*, 2001). The fact that small farmers living in remote rural areas cannot sell some of their management time off-farm is the key problem, and one that many authors overlook.

Furthermore, as mentioned in Chapter 2, motives for participating in a cropland rental market require agent heterogeneity (Carter and Salgado, 2001; Teklu and Lemi, 2004). In the current framework, three types of agent heterogeneity and their combinations, which

are essential to shape the allocative impacts of land transfers, are considered (Carter and Salgado, 2001). These include:

- different endowments of productive factors;
- farm management ability; and
- different access to credit.

The literature suggests that an efficient land rental market boosts agricultural productivity and hence farm incomes via factor price equalisation effects, specialisation effects and investment effects (Atwood, 1990; Carter, 2000; Kille and Lyne, 1993). For the market to function efficiently, land tenure must be secure and transaction costs must be low (Lyne and Thomson, 1998). Figure 3.1 summarises the theoretical links among government policy, land tenure security, transaction costs, land rental markets and farm productivity (see also Feder *et al.* 1988; Kille and Lyne, 1993; Place *et al.*, 1994; Place, 2009).

- *Factor price equalisation effects*. An active land rental market will impose an opportunity cost on idle and underutilised land (Lyne and Nieuwoudt, 1991). Hence the market promotes efficient land use and reduces imbalances in factor endowments at household level, leading to greater equalisation of the shadow prices of land, labour and capital inputs across farming households (Carter, 2000; Lyne and Nieuwoudt, 1991; Sadoulet *et al.*, 2001).

- *Specialisation effects*. An active land rental market could lead to comparative-advantage gains by transferring land into the hands of more effective farmers (i.e. those willing farmers with more farm management ability and the complementary inputs required to farm) and permitting them to specialise in agricultural production (Carter, 2000; Kille and Lyne, 1993).

- *Investment, conservation and adoption of technology effects*. Investments could be increased through direct tenure security-induced incentives, farm size incentives and market-induced incentives, including credit supply effects of using land or rental contracts as collateral (Atwood, 1990; Feder *et al.*, 1988; Kille and Lyne, 1993). An active land

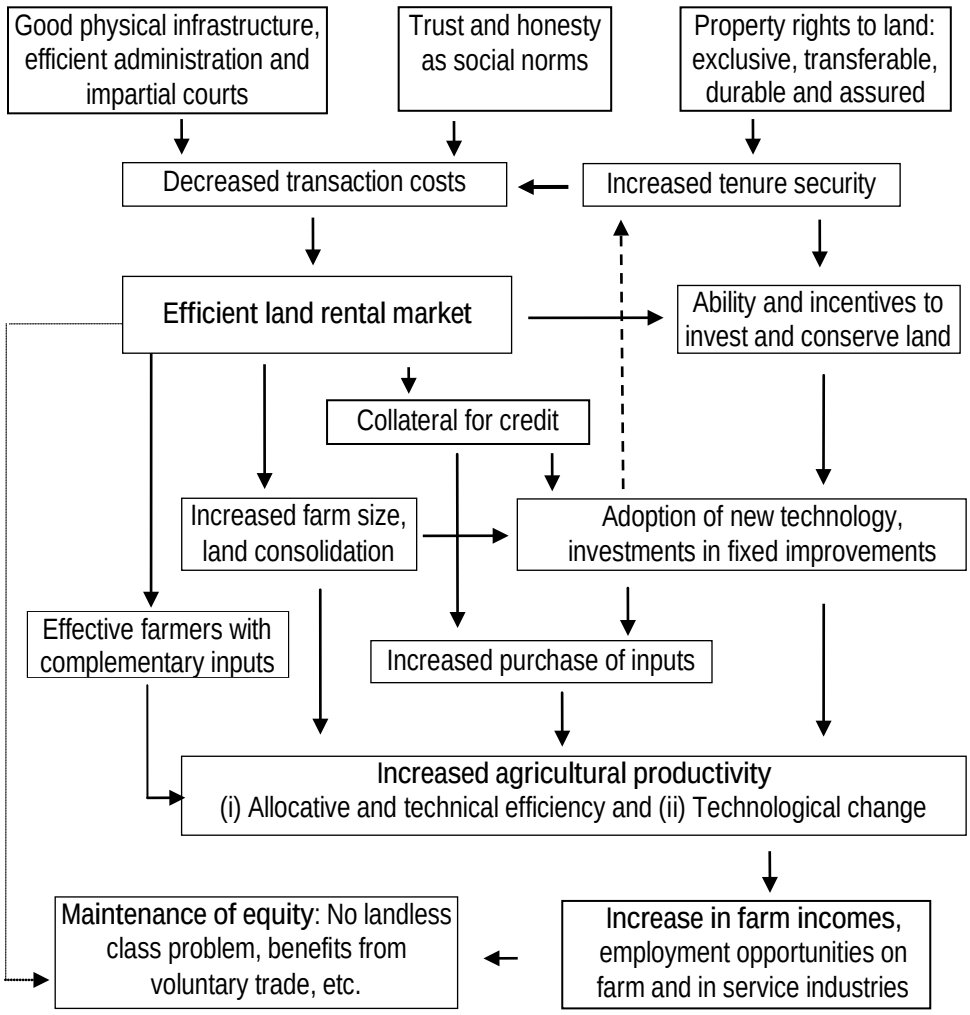


**Figure 3.1 Conceptual model linking policies, tenure security, land rental markets and agricultural productivity**

market provides investors a safe exit option of selling or leasing the land and recouping, at any time, the present value of the expected future income generated by fixed improvements (Kille and Lyne, 1993). Hence, market-induced incentives (or 'an investment regret mitigation effect' as Carter (2000) terms it) in combination with the direct security-induced effects encourage land conservation and investments in fixed improvements (Carter, 2000; Kille and Lyne, 1993). Perhaps more importantly, an efficient land market allows consolidation and growth of farms and these strengthen the

incentive to invest in farm knowledge and new agricultural technologies (Kille and Lyne, 1993). The market permits effective farmers to expand the operational scale of their farms over time and to take advantage of size economies, making investment in farm knowledge and new technologies (including divisible technologies) more profitable (Kille and Lyne, 1993) and reducing cost inefficiency due land fragmentation (Hung *et al.*, 2007; Swinnen *et al.*, 2006).

However, there is also evidence suggesting that investment may be undertaken to enhance tenure security (Besley, 1995; Brasselle, Gaspart and Platteau, 2002; Place *et al.*, 1994; Sjaastad and Bromley, 1997). Results from empirical studies on this issue are mixed (see, for instance, Besley, 1995; Brasselle *et al.*, 2002; Deininger and Jin, 2006; Migot-Adholla, Benneh, Place and Atsu, 1994; Place and Otsuka, 2002; Sjaastad and Bromley, 1997). These empirical examples suggest that the causal links between tenure security and investment may be context-dependent (Place, 2009). Additionally, Brasselle *et al.* (2002) assert that a methodology that effectively controls for this causality problem is essential before any conclusions about the tenure security-investment relationship can be reached.

## 3.2 Theoretical Models

### 3.2.1 An Agricultural Household Model with Imperfect Factor Markets

In microeconomic theory, the problems of production decisions, consumption decisions, and labour supply decisions are usually analysed separately through the behaviour of producers, consumers and workers. In the case of a farming household, the decision maker (often the household head) is engaged simultaneously in production, consumption, and work decisions (Sadoulet and de Janvry, 1995). This section presents a static model to endogenously predict farming household decisions to participate in a land rental market characterised by transaction costs and in the presence of imperfect markets for labour and credit[1]. The structure of the model is based on the work by Sadoulet *et al.* (2001), Carter and Yao (2002), and Vranken and Swinnen (2006).

[1] To concentrate on the role of transaction costs, several aspects of household decisions will be ignored, especially the role of different risk bearing capacity and intra-annual credit constraints.

To develop the model, a context where the following conditions hold is assumed:
*(i)* farming households are heterogeneous in terms of farm management ability, labour, land, access to capital, and other fixed factor endowments;
*(ii)* there are transaction costs in cropland rental markets, which raise the rent effectively paid by lessees and lower the rent effectively received by lessors;
*(iii)* access to credit is wealth constrained, and land owned can serve as collateral; and
*(iv)* there is moral hazard in hired labour that requires supervision by household members.
These conditions are considered generally applicable to rural Vietnam.

Consider a farming household that is endowed with initially owned cropland stock $\overline{A}$, labour $\overline{L}$, farm assets $K$, liquid asset $M$, and a latent level of household-specific farm management ability $\theta$ (or agricultural comparative advantage as Carter and Yao (2002) term it) as a non-tradable farm management input. The household can derive income from agricultural production on its farm and from off-farm wage employment. Agricultural production follows a production technology that relates inputs to outputs:

$$Q = \theta f(A, L, X, K; \beta_q),$$

where $\beta_q$ represent technological parameters of the production function[2]. That is the production of agricultural output $Q$ requires an amount of cropland $A$, effective labour input $L$ (i.e. family labour input or hired labour input or both), purchased inputs $X$ (e.g. seeds, fertilisers and pesticides) with a price vector $p_x$, farm assets $K$ and the household's latent level of farm management ability $\theta$, with $0 \le \theta \le 1$.

Given its initially owned cropland $\overline{A}$, the farming household adjusts its operated farm size $A = \overline{A} + A^i$ or $A = \overline{A} - A^o$ by renting in or out cropland with amount of $A^i$ or $A^o$, respectively. Based on the literature review in Section 2.5.1, renting in or out cropland is affected by transaction costs that lead to the effective rented-in price $r^i$ being higher than the effective rented-out price $r^o$, creating a 'price band' (Crookes and Lyne, 2003; Key *et*

[2] The production function $f(\bullet)$ is a frontier relation between resources used in the production process and corresponding outputs. The function is assumed to have standard properties, i.e. increasing, strictly quasi-concave, and continuously differentiable in its arguments.

*al.*, 2000). If the transaction costs are expressed in money terms, then the effective rent paid and received by a lessee and lessors can be written as $r^i = r + TRC^i = r(TRC^i)$ and $r^o = r - TRC^o = r(TRC^o)$ respectively, where $r$ is the per unit rent in the absence of transaction costs and $TRC^i$ and $TRC^o$ are transaction costs associated with per unit renting-in and renting-out cropland, respectively. Hence $r^i - r^o > 0$ is an indicator of the size of per unit transaction costs and $A^i \cdot r^i$ ($A^o \cdot r^o$) is the household's rental cost (income).

Another feature of the agricultural production problem is that output depends on inputs of labour effort, not just labour time (Carter and Olinto, 1998). Cropland transactions are therefore influenced by imperfections in the market for farm labour (caused by moral hazard associated with supervising hired labour) and by the amount of family labour working on the farm (Frisvold, 1994; Sadoulet *et al.*, 2001). As argued by Carter and Olinto (1998), family labour may be used for supervision, but the efficiency of supervision diminishes as farm size increases. Accordingly, the effective labour supplied by hired workers is defined as a product of the nominal amount of hired labour ($L^i$) and household's supervision function $s\left(A, L^f\right)$ with $0 \le s(\bullet) \le 1$ to reflect how nominal hired labour is transformed into effective labour. Given its labour endowment $\bar{L} = L^f + L^o + l$, the household allocates time between working on-farm, $L^f$, working off-farm, $L^o$, and leisure (home time), $l$. Then the effective labour input in farming ($L$) becomes:

$$L = L^f + s\left(A, L^f\right) \cdot L^i,$$

where $s(\bullet)$ increases in $L^f$ (i.e., $s_{L^f} \ge 0$) to reflect a positive effect of the amount of family labour on supervision, and $s(\bullet)$ decreases (increases) in $A$, i.e., $s_A^i \le 0$ ($s_A^o \ge 0$) to reflect the diminishing (enhancing) effect of supervision as farm size grows (shrinks). As the moral hazard requires supervision and raises the cost of hired labour, we may expect that the wage rate of on-farm hired labour, $w^i$, is smaller than the wage rate of off-farm family labour, $w^o$. To fill the wage gap, it is assumed that the off-farm labour market is cleared by quantity rationing instead of price rationing (see, for example, Yao's (2000)

time rationing model). The rationed off-farm wage employment is incorporated into the model by setting $L^o \leq \overline{L^o}$, where $L^o$ is household labour employed off farm with upper limit $\overline{L^o}$. Therefore, the net labour costs can be written as $w^i L^i - w^o L^o$.

Participation in the cropland rental market is also affected by markets for credit. Not all production costs incurred before the harvest income can be financed from household savings and therefore working capital is required during the growing season. The amount of credit to which the household has access is typically determined by the assets that the household owns, including liquid assets ($M$) and the amount of owned cropland ($\overline{A}$) even if land is not used as collateral (Feder *et al*, 1988)[3]. The assumption that access to credit depends on the amount of cropland owned is often found in development economics literature (e.g., Eswaran and Kotwal, 1986; Sadoulet *et al.*, 2001; Vranken and Swinnen, 2006). Accordingly, it is assumed that the maximum amount of credit $M(\overline{A})$ that the household can obtain by using its owned cropland $\overline{A}$ as collateral is defined as an increasing function of $\overline{A}$. Then, the household's liquidity constraint can be written as:

$$p_x X + (w^i L^i - w^o L^o) + (-)A^{i/(o)} \cdot r^{i/(o)} \leq M + M\left(\overline{A}\right)$$

Household utility, $U(y,l)$, is defined as an increasing function of net income (earned in agricultural production and off-farm wage labour), $y$, and leisure, $l$. For simplicity, the utility function is taken as $U(y,l) = y + U(l)$ (Sadoulet *et al.*, 2001). Furthermore, the agricultural output price is normalised to one so that $Q = \theta f(A, L, X, K; \beta_q)$ is also gross income from agricultural production. Hence the household net income is given by:

$$y = Q - p_x X - w^i L^i + w^o L^o - (+)A^{i/(o)} \cdot r^{i/(o)}$$

The household's decision problem is to choose the amount of rented-in, $A^i$, or/and rented-out land, $A^o$, the amount of hired labour, $L^i$, the level of purchased inputs, $X$, and to allocate its labour endowment between working on-farm, $L^f$, working off-farm, $L^o$, and

[3] This may reflect a positive correlation between farm size and ability to service debt.

leisure (home time), $l$. Mathematically, the household's maximisation problem can now be written as:

$$\max_{A^i, A^o, X, L^f, L^i, L^o, l} \quad Q - p_x X - w^i L^i + w^o L^o - (+)A^{i/(o)} \cdot r^{i/(o)} + U(l)$$

subject to

- liquidity constraint: $p_x X + (w^i L^i - w^o L^o) + (-)A^{i/(o)} \cdot r^{i/(o)} \leq M + M(\bar{A})$
- off-farm wage employment constraint: $L^o \leq \bar{L}^o$
- farm management ability and technology constraint: $Q = \theta f(A, L, X, K; \beta_q)$
- time constraint: $\bar{L} = L^f + L^o + l$, and
- $A^i, A^0, L^i, L^o, L^f, l, X \geq 0$

The first order Kuhn-Tucker conditions of solutions for the optimal operated farm size of household ($A^*$) are as follows[4]:

$$\theta^i(f_A^i + f_L s_A^i \cdot L^i) - (1 + \lambda_M^i) r^i \leq 0; \; A^i \frac{\partial \Lambda}{\partial A^i} = 0 \tag{3.1}$$

$$-\theta^o(f_A^o + f_L s_A^o \cdot L^i) + (1 + \lambda_M^o) r^o \leq 0; \; A^o \frac{\partial \Lambda}{\partial A^o} = 0 \tag{3.2}$$

and $\lambda_M^i, \; \lambda_M^o \geq 0$

where subscripts refer to first derivatives, $\Lambda$ is the Lagrangian function, and $\lambda_M^i$ and $\lambda_M^o$ are the Lagrange multipliers.

In the conditions (3.1) and (3.2), $(1 + \lambda_M^i) r^i$ or $(1 + \lambda_M^o) r^o$ capture the opportunity cost (or shadow prices) of cropland rented in or rented out in the presence of credit constraints. If hired labour is working on the farm, i.e. $L^i > 0$ then, by renting in (out) cropland, $f_L s_A \cdot L^i$ reflects extra (fewer) supervision costs associated with growing (shrinking) farm size. If only family labour is employed, i.e. $L^i = 0$, then $f_L s_A \cdot L^i$ is zero.

[4] A more detailed derivation is given in Appendix A.

It should be noted that this household model does not treat household labour supply as the horizontal sum of labour supplied by individual workers at different wage rates. Consequently, the estimated household labour supply function could be overly wage inelastic, or even backward-bending (Nieuwoudt and Vink, 1988). This, in turn, would tend to understate production responses estimated with the model. This criticism differs from the well-documented concern that labour allocation decisions may be taken by individuals and not by 'the household', i.e. the model may not be consistent with the methodological individualism that is a basic premise of microeconomic theory (Bardhan and Udry, 1999). However, in this regard, the notion of a household utility function requires only that there is agreement between household members on the way household labour is allocated. Neither of these concerns has meaningful consequences for this study which uses the model only to identify propositions about transaction costs and household participation in the cropland rental market, and not to estimate consumption elasticities.

### 3.2.2 Transaction Costs, Price Band and Land Rental Market Regimes

Conditions (3.1) and (3.2) imply that if there were no transaction costs in the cropland rental market (i.e. $r^i = r^o$) and no imperfections in other markets, the household would always reach its optimal operational farm size. Given the existence of transaction costs associated with rental market participation, i.e. $r(TRC^i) > r(TRC^o)$, conditions (3.1) and (3.2) imply three distinct cropland rental market regimes. The amount of optimal operational landholdings chosen by the household determines whether it participates in the cropland rental market as a lessor or a lessee, or whether it chooses to be in autarky.

If the household rents cropland in but does not rent cropland out, i.e. $A^i > 0;\ A^o = 0$, the first component of condition (3.2) holds with strict inequality and that of condition (3.1) holds with equality, i.e.

$$\theta^i(f_A^i + f_L s_A^i \cdot L^i) - \left(1 + \lambda_M^i\right) r^i = 0$$

Given that $s_A^i \leq 0$ (reflecting the diminishing effect of supervision as farm size grows if the household hires labour besides the family labour) and that $\lambda_M^i \geq 0$ (reflecting the

liquidity constraint on renting cropland in) then, for a household that is a lessee ( $A^* > \bar{A}$ ),

$$\theta^i f_A^i > r^i = r(TRC^i) \tag{3.3}$$

Condition (3.3) implies that the latent value of marginal product of cropland in the cropland autarky must be higher than effective rent paid in order for the household to rent in land.

In contrast, if the household rents cropland out but does not rent cropland in, i.e. $A^o > 0$; $A^i = 0$, the first component of condition (3.1) holds with strict inequality and that of condition (3.2) holds with equality, i.e.

$$-\theta^o (f_A^o + f_L s_A^o \cdot L^i) + \left(1 + \lambda_M^o\right) r^o = 0$$

By renting out cropland, $s_A^o \geq 0$ to reflect the enhancing effect of supervision as farm size shrinks (if the household hires labour besides the family labour), and $\lambda_M^o = 0$ to reflect the relaxation of the liquidity constraint. Hence, for a household that is a lessor ( $A^* < \bar{A}$ ),

$$\theta^o f_A^o < r^o = r(TRC^o) \tag{3.4}$$

Condition (3.4) implies that the latent value of marginal product of cropland in the autarky must be lower than effective rent received in order for the household to rent out land.

Finally, if the household is in autarky and cropland is neither rented in nor out (i.e. a double corner solution, $A^o = 0$ and $A^i = 0$ ), then the first components of both conditions (3.1) and (3.2) hold with strict inequality. So, for a household that is in autarky ( $A^* = \bar{A}$ ),

$$r(TRC^o) < \theta f_A < r(TRC^i) \tag{3.5}$$

Conditions (3.3) - (3.5) indicate that, given the current state of technology, the household decision on market status is simultaneously affected by the magnitude of the marginal product of cropland in cropland autarky and the magnitude of and difference between the rental prices for renting in and renting out cropland. These conditions also highlight the important role of household-specific farm management ability, $\theta$. In addition, conditions

$A^i > 0$ and $A^o = 0$ or $A^o > 0$ and $A^i = 0$ imply that there is no simultaneous renting in and out cropland. This result is based on the assumption that there are no major differences in, for example, quality or location of endowed and rented cropland. If characteristics of cropland plots are very different, simultaneous renting in and out of cropland by the same household may be observed (Vranken and Swinnen, 2006).

Figure 3.2 illustrates the three cropland market regimes and the farming household's supply of, and demand for, cropland as a function of the market rent under transaction costs. Let $S_A$ and $D_A$ represent the household's cropland supply and demand curves in the absence of transaction costs (i.e. a competitive market). In this setting, the household receives the market rent *r* at any level of cropland quantity it supplies to the market; hence

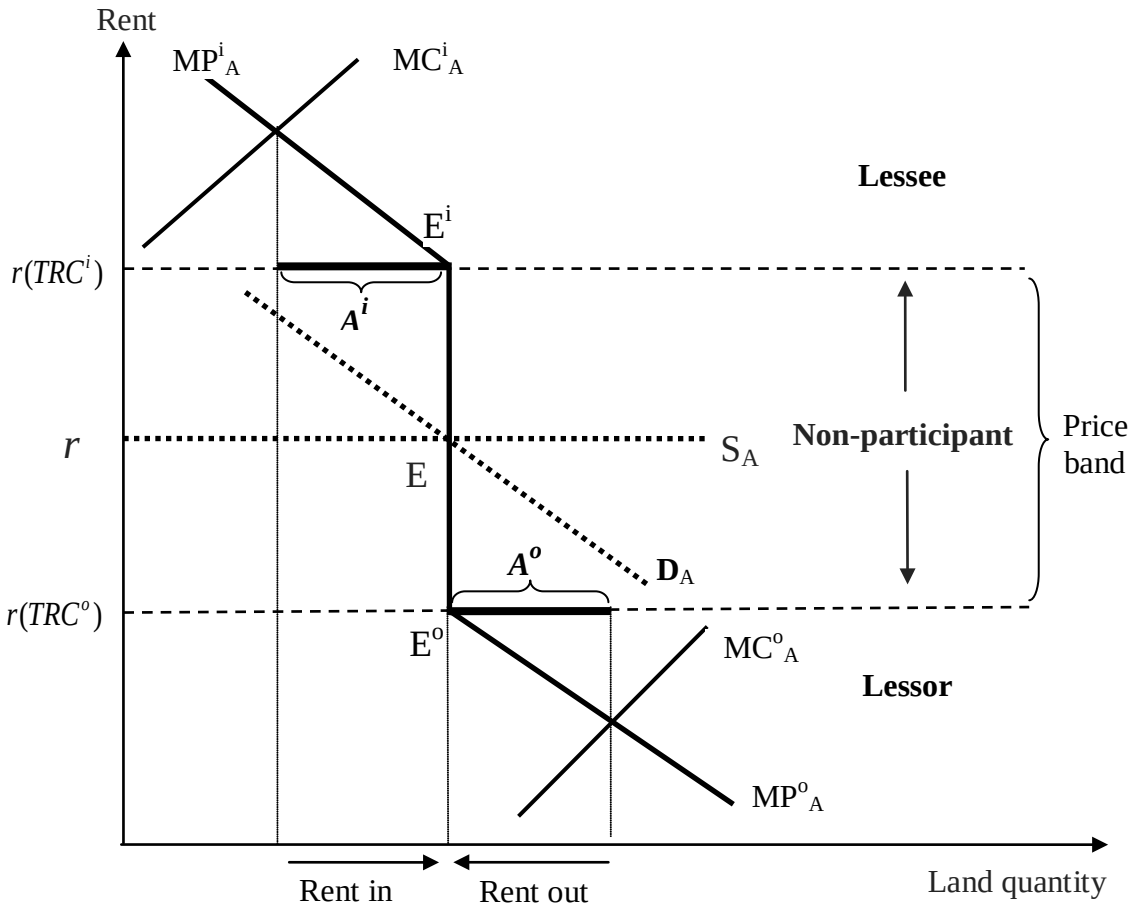


**Figure 3.2 Transaction costs and the household decisions to participate in a land rental market**

the supply curve, $S_A$, is horizontal. The demand curve, $D_A$, represents the household's marginal productivity of cropland and hence it is downward sloping in the presence of diminishing marginal returns. In the presence of transaction costs, the costs cause a gap between rented-in and rented-out prices, creating a 'price band' by shifting the demand curve upward for lessees while downward for lessors. The autarky bandwidth is expected to widen with an increase in transaction costs on either side of the rental market. Other factors affecting the cropland market regimes include the marginal product of cropland and associated household-specific farm management ability, marginal product of labour, the moral hazard problem of hired labour, and credit market constraints (see equations (3.1) - (3.5)). Combining the market participation decision determined by equations (3.3) - (3.5) with the supply and demand curves under each cropland market regime gives the overall cropland supply and demand curves which have three distinct regions. For instance, the household's overall demand for cropland is the stepped curve $MP^i_A E^i E^o MP^o_A$ depicted in Figure 3.2.

### 3.2.3 Land Rental Market and Farm Efficiency

As suggested by the conceptual framework (Figure 3.1), an efficient land rental market raises farm productivity by (i) encouraging the transfer of cropland from less effective to more effective farming households; and (ii) reducing cropland fragmentation to exploit economies of scale (see also Crookes and Lyne, 2003; Norton, 2004; Rahman and Rahman 2008; Wan and Cheng, 2001; Awasthi, 2009). Evaluating efficiency of the rental market, therefore, presumes that the most effective farmers are known. Accordingly, it is important to measure and explain the performance of farming households in order to examine the effects of cropland rental market participation on farm performance.

When discussing the economic performance of a farm, it is common to describe it as being more or less 'efficient' or more or less 'productive'. The efficiency of a farm, as discussed by Coelli, Rao and Battese (2005) and Fried and Lovell (2008), is a comparison between observed and optimal values of its output or input or both. If the optimum is defined in terms of production possibilities, efficiency is technical. If the optimum is defined in terms of cost, revenue or profit, efficiency is economic. Economic efficiency

has technical and allocative components. The allocative component refers to the ability to combine inputs or outputs or both in optimal proportions in light of prevailing prices (Fried and Lovell, 2008). Another related concept, the productivity of a farm, as commonly defined in the literature, is measured as the ratio of its output to its input (Coelli *et al.*, 2005; Fried and Lovell, 2008). This suggests that an increase in operating efficiency implies higher farm productivity but the reverse may not hold. Variation in productivity either across farms or through time, in principle, can be attributed to differences in (i) production technology, (ii) the scale of operation, (iii) operating efficiency, and (iv) the operating environment in which production occurs (Coelli *et al.*, 2005; Fried and Lovell, 2008; Gathon and Pestieau, 1995).

Recall from equations (3.3 - (3.5) that, for farming household $h$, household-specific farming ability, $\theta$, directly affects its latent value of the marginal product of cropland in autarky, $\theta f_A$. That, in turn, affects household decisions to rent land in or out. However, the household's farming ability is unobserved. The literature often suggests that household-specific technical efficiency can be used as a proxy for the unobserved household farming ability (e.g. Carter and Olinto, 1998; Carter and Yao, 2002; Deininger and Jin, 2005). The concept of technical efficiency, as mentioned earlier, refers to the ability to avoid waste, either by producing as much output as technology and input usage allow or by using the least input possible to produce a given level of output with the prevailing technology (Coelli *et al.*, 2005; Fried and Lovell, 2008).

Figure 3.3 illustrates the concept of technical efficiency and productivity and the distinction between them in an output dimension for a simple case of one output and one input (i.e. cropland). In the figure, the production frontier defines the maximum output attainable from each input level given the level of technology available. Farming households operate either on or beneath the production frontier. The technical efficiency of a farming household operating at point $E^0$ is defined as the ratio $AE^0/AE^1$, where $E^1$ is the maximum output attainable from *A* units of land. It follows from this definition that technical efficiency lies in the [0, 1] interval and that the higher is farming ability the closer is technical efficiency to unity.

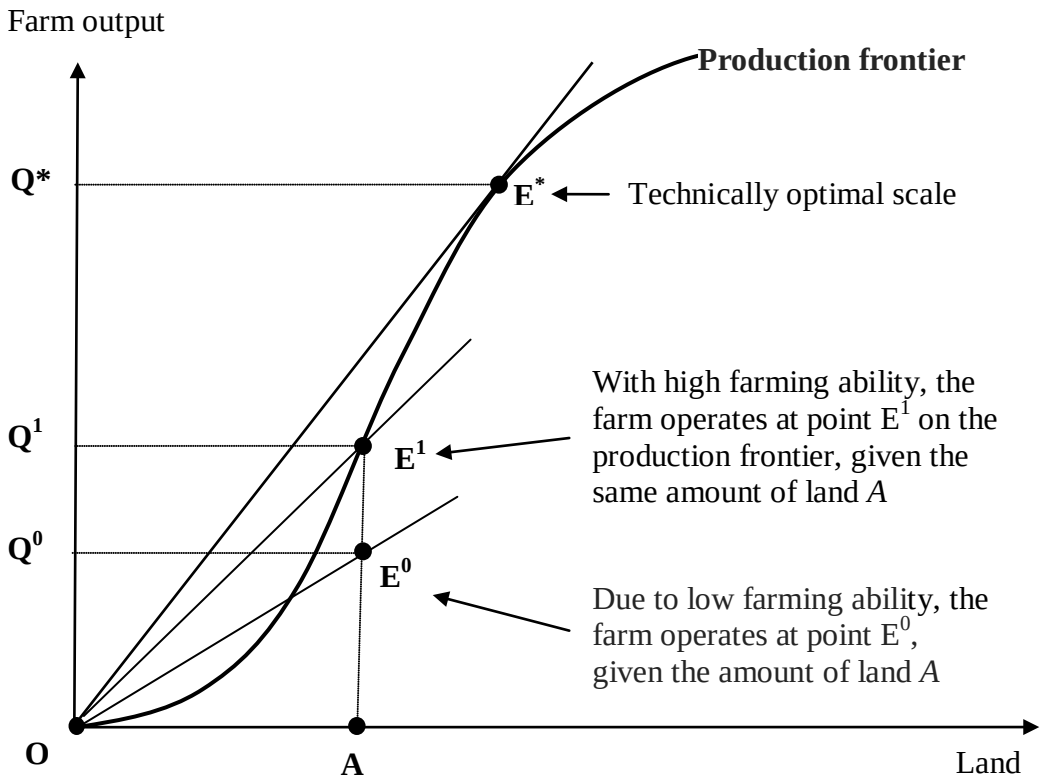


**Figure 3.3 The production frontier, technical efficiency and productivity**

The slope of a ray through origin is used to measure productivity at a particular data point. In Figure 3.3 for example, the productivity of the farming household operating at point $E^0$ is the slope of the ray $OE^0$, which is $Q^0/A$. If the farming household operating at point $E^0$ were to move to the technically efficient point $E^1$, the slope of the ray would be greater, implying higher productivity at point $E^1$, given the level of *A* units of land (i.e. $Q^1/A > Q^0/A$). Therefore, an increase in the technical efficiency implies higher farm productivity for any given levels of inputs, but the reverse may not hold.

As noted before, an increase in the farm productivity cannot be attributed to technical efficiency improvements alone, but may be due to the exploitation of economies of scale or technical changes or changes in the environment in which farms operate or some combination of these factors. In Figure 3.3 for example, the greatest slope is at the point $E^*$ where the ray from the origin is at a tangent to the production frontier and therefore defines the point of maximum possible productivity. By moving from $E^1$ to $E^*$, the

farming household would achieve its highest productivity while maintaining technical efficiency. This movement is an example of exploiting economies of scale. $E^*$ is the point of technically optimal scale. The farming household operating at any other points on the production frontier would result in lower productivity. Given that the scale of a farming operation can seldom be changed quickly, technical efficiency and productivity can in some cases be given short-run and long-run interpretations.

In this study, the estimate of household-specific technical efficiency rather than productivity is taken as a proxy for unobserved household farming ability, and is used to test whether or not rental transactions transfer cropland from less effective to more effective farming households. If a comparison of the mean farming ability of lessees ($\overline{\theta}^i$) and lessors ($\overline{\theta}^o$) shows that $\overline{\theta}^i > \overline{\theta}^o$ then, on average, the land rental market leads to efficiency-enhancing land transfers by moving land from less to more effective users.

## 3.3 Testable Hypotheses

The literature review, conceptual framework and results derived from the theoretical models presented in Section 3.2 yield several testable hypotheses about factors that affect a rural household's decision to participate in the rental market for cropland, *ceteris paribus.*

First, there are hypotheses relating to farm performance and motives for land market participation:

(i) Imperfections in non-land factor markets are hypothesised to create a need for adjustment through the cropland rental market.

(ii) Households more efficient, willing and able to farm have an incentive to rent in cropland while those less efficient, willing and able to farm have an incentive to rent out cropland. Consequently cropland tends to shift from less to more effective users, allowing these emerging farmers to specialise in agriculture.

(iii) Imperfect credit markets affect cropland market regimes through the shadow price of the liquidity constraint in the household optimisation problem. Stricter credit constraints imply a higher value of the shadow price of the liquidity constraint and to ease this, the household is more likely to rent out cropland and less likely to rent in cropland. This is likely reinforced by a secondary effect that liquidity constraints have on labour used on the farm, where an increase in the shadow price of the liquidity constraint results in a decrease in hired labour and hence farm labour input that leads to a decline in the marginal productivity of cropland. Consequently, the likelihood of renting in cropland is further reduced while the likelihood of renting out cropland increases.

(iv) An increase in opportunities and wages for off-farm employment will create opportunities for households endowed with relatively more mobile and skilled workers to supply more cropland. This is expected to reduce the equilibrium rental price and, in turn, encourage households that specialise in agricultural production to rent in more cropland. Likewise, an increase in the wage rate for farm labour resulting from an increase in farm labour productivity is also expected to encourage farming households to rent in more cropland. Conversely, scarcer off-farm labour opportunities will tend to increase the household's supply of farm labour, reduce the supply of cropland to the rental market and so reduce the quantity of cropland transacted in the rental market.

Second, there are hypotheses relating to transaction costs, price band and land market participation:

(i) Transaction costs incurred entering the cropland rental market are hypothesised to induce significant differences between the effective rent paid by lessees and the effective rent received by lessors, and selectively exclude farming households from market participation. Transaction costs in the cropland rental market create a price band that can be interpreted as evidence of market failure for specific farming households (de Janvry *et al.*, 1991). If there are no transaction costs in the rental market, then the price band may be trivial. A non-trivial price band exists in the

cropland rental market if and only if transaction costs exist. However, if market failure is not a selective phenomenon (in the sense that specific conditions faced by a household do not significantly determine participation status), the width of the price band will be the same across all households. If the homogeneity of the price band is rejected, the reasons behind market failure can then be identified through variables that affect transaction costs.

(ii) There are asymmetries in transaction costs on the supply and demand sides of the rental market relating to the choice of market regime and to the extent of cropland renting after having decided to rent cropland in or out. These asymmetries in transaction costs may stem from the potential problems of moral hazard and adverse selection in cropland rental arrangements (Bell and Sussangkarn, 1988; Thomson and Lyne, 1991).

(iii) A household is less likely to participate in the cropland rental market as a lessee when the effective renting-in price increases, or as a lessor if the effective renting-out price decreases. This means that any increase in positive transaction costs, including risk, associated with cropland transfers in the rental market will expand the autarky bandwidth and thus reduce the number of land market participants and the number of efficiency-enhancing cropland transactions.

## 3.4 Chapter Summary

This chapter presented a conceptual framework, proposed a farm household model and stated the testable hypotheses. It started with a discussion about the channels through which an efficient cropland rental market helps to increase agricultural productivity and presented a conceptual framework that links policies, tenure security, transaction costs, land rental markets and agricultural productivity. A theoretical model was proposed to explain a rural household's motive for participating in the land rental market, and its behaviour in the presence of transaction costs. The chapter then discussed an approach that can be used to evaluate efficiency of the rental market for cropland. This involves

measuring farm performance and examining the effect of cropland rental market participation on farm performance. The chapter then stated testable hypotheses drawn from the model and conceptual framework.

Chapter 4 describes the data sources used for empirical analyses and presents a descriptive overview of the cropland rental market in rural Vietnam. Chapter 5 is concerned with measuring and explaining the farm performance of farming households and examining the effects of cropland rental market participation on this performance. A stochastic frontier model is estimated for this purpose. Chapter 6 is concerned with identifying and understanding transaction costs that affect participation in - and hence the efficiency of - the cropland rental market in rural Vietnam. A generalised ordered logit model that allows market participation thresholds to vary with transaction costs is specified and estimated for this purpose.

# Chapter 4

# Data and Descriptive Statistics

**This chapter**

* describes the data sources used for the empirical analysis;
* defines and classifies populations and sub-populations of interest;
* estimates and reports the sample summary statistics; and
* presents descriptive analyses of the current situation, patterns and trends in the cropland rental market in rural Vietnam.

## 4.1 Data Sources

### 4.1.1 The Vietnam Household Living Standards Survey

The main data sources used in this study are household-level data gathered in 2004 and 2008 for the Vietnam Household Living Standard Survey (VHLSS) by the General Statistics Office of Vietnam. The VHLSS is a comprehensive nationwide survey comprising of two main parts: a household survey and a commune survey. The household survey recorded data on household membership, education, employment, health, production, income, expenditure, consumer durables, assets and participation in poverty reduction programs. The commune-level survey collected data on commune demography, land and agricultural production, employment, local infrastructure, education, health, and social affairs. With technical support from the World Bank and the United Nations Development Programme (UNDP), the VHLSS is a well-designed survey by international standards (Trung and Hung, 2009, Tung and Phong, 2006).

Both the 2004 VHLSS (henceforth VHLSS04) and 2008 VHLSS (henceforth VHLSS08) are three-stage stratified cluster samples, drawn from a master sample. In the first stage of

sample selection, a total of approximately 3,000 communes were selected. Each sampled commune from the first stage was then partitioned into a varying number of enumeration areas based on the 1999 Population Census. In the second stage of sample selection, three enumeration areas were randomly selected from each sampled commune, making up the so-called master sample. In the final stage, three households were randomly selected from each sampled enumeration area for interview, yielding a total of approximately 9,000 households in each round of the VHLSS (Trung and Hung, 2009, Tung and Phong, 2006).

One objective of the master sample is to provide reliable data for estimates at the regional level. Accordingly, estimates from the VHLSS data are considered statistically representative at the national, rural, urban, and regional levels. Vietnam is commonly divided into eight relatively homogenous agro-ecological regions, namely, Northwest, Northeast, Red River Delta, North Central Coast, South Central Coast, Central Highlands, Southeast, and Mekong River Delta. As geographical heterogeneity across regions is to be expected, regional differences are exploited in subsequent analyses. However, estimates cannot be considered statistically representative at the provincial or lower administrative levels.

### 4.1.2 The Agricultural Land Module

This study focuses on the agricultural land module of the survey instrument included in both surveys. This module collects plot-level information about the agricultural land, its use, users, water access and retrospective data based on recall that can be used to better understand the history of household landholdings and which provides a view of the development of cropland markets in recent years. For example, one section asks households how they initially acquired their land - whether through commune allocation, purchase, inheritance, reclamation, or other means. Another section asks when they started using the plots of land to which they currently have land-use certificates and how they initially obtained their land-use rights. It is worth noting that the VHLSS04 and VHLSS08 were respectively the first and second of Vietnam's nationally representative household surveys to ask about land-use right certificates (LUCs) at the plot-level.

The data on agricultural land, however, were available only for households that used or managed farmland during the 12 months preceding the survey. Since the information on household land rental market participation comes from this section, neither the VHLSS04 nor the VHLSS08 provide information on land rented out by rural households that did not undertake any farming during that 12 month period. This is an issue that affects all studies of agricultural land market activity, whether in Vietnam or elsewhere, that follows the standard format of the World Bank Living Standards Measurement Study to examine farmland transactions (Grosh and Glewwe, 2000). The magnitude and severity of a possible bias introduced by such non-inclusion and the loss of information depends on the situation at hand; for instance, the incidence of absentee lessors. The author's reading of the literature and casual observations suggest that such bias is negligible in the VHLSS04 and VHLSS08.

The commune-level survey provided further data on local land use, agricultural production and living conditions. For this study, several components of the commune level survey are used, including data on land titling and related issues, social institutions, infrastructure, and general commune economic characteristics.

For the most part of this study, estimates are computed from cross section sample data pooled across the VHLSS04 and VHLSS08 datasets. Although a small sub-sample (approximately 20%) in 2004 was re-interviewed in 2008, discarding observations, particularly those on renting in or renting out land, to create panel data would imply the loss of a large amount of valuable information. Other problems of forming panel data include the high attrition rate of respondents and difficulties identifying panels across the VHLSSs in the absence of clear guidelines from the data provider and some inconsistencies (Trung and Hung, 2009). In contrast, the independently pooled cross section preserves information on land rental markets and increases the sample size. This gives rise to more precise estimators and test statistics with more power (Wooldridge, 2003). One minor statistical issue often associated with pooled cross section data is that sampling from the population at different points in time likely leads to observations that are not identically distributed. In practice, however, this can be easily addressed by

introducing dummy variables that allow the intercept, and in some cases the slope coefficients, to differ in a multiple regression model across periods (Wooldridge, 2003).

### 4.1.3 Rural Households with Cropland

As mentioned, the VHLSS04 and VHLSS08 surveys identify various types of farmland, including annual cropland, perennial cropland, forestland, water surface land, grassland[1], garden land, swidden land[2] and 'other' land, which includes land for salt production and newly cleared land. This study focuses on cropland and therefore excludes forestland, water surface land and 'other' land. In addition, garden land is treated as perennial cropland as these two land types have similar land use rights. Garden land basically comprises land inherited and an area known as ‘five per cent land’ that was given to households for their private use at the beginning of collectivisation (this was meant to be equal to five per cent of the commune’s agricultural land). All farmland types other than perennial cropland and garden land are treated as annual cropland.

This study focuses on only rural households with cropland (as defined above) for which the sample sizes are 5,782 and 5,648 for 2004 and 2008, respectively. Figure 4.1 presents a framework of sub-populations for subsequent analyses in which the population of rural households with cropland is classified according to the timeline of rental market participation (see also Appendix B). A rural household is defined as a landless lessee if it has no cropland other than cropland it rents in. In contrast, a landed household is defined as a rural household that possesses some positive amount of cropland. Only landed households are considered when analysing the effects of land titling. The two terms 'cropland endowment' and 'owned cropland' are used interchangeably.

As can be seen from Figure 4.1, the share of landless lessees accounts for less than one per cent of the rural sample, while over 99 per cent of this population comprises landed

[1] In Vietnam, grass grown on grassland is commonly treated as a crop as it requires efforts to raise it.

[2] Swidden land is hilly or mountainous land that is cleared through burning, farmed for a few years, and then abandoned or, more commonly today, left fallow for a few years. In Vietnam, this form of cultivation is practiced primarily by ethnic minorities.

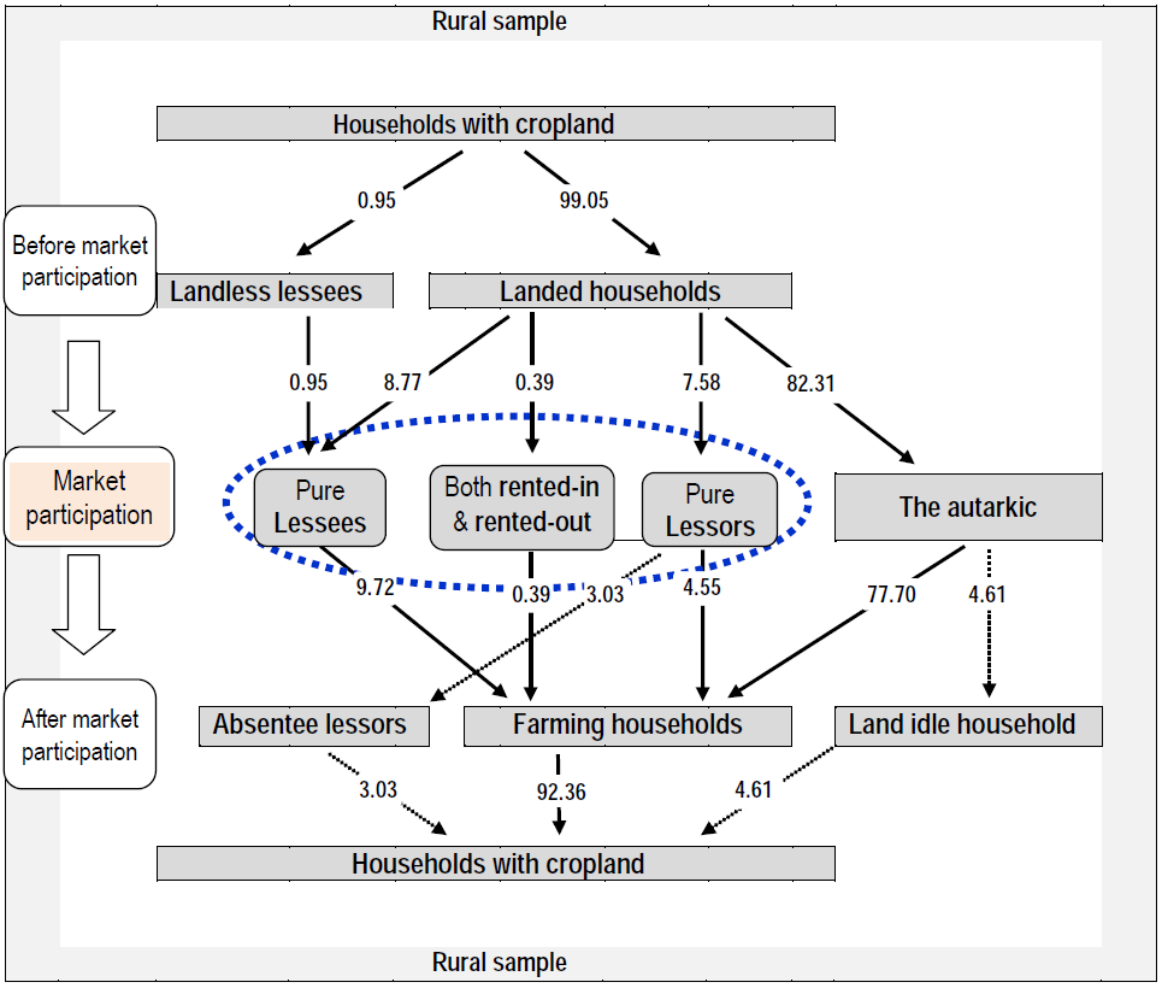


**Figure 4.1 Population of rural households with cropland and its sub-populations (%)**

Source: Computed from VHLSS04 and VHLSS08.

Note: Shares of sub-populations are computed from the pooled sample of VHLSS04 and VHLSS08. Sample size is 11,430. Sample weights are used to compute population statistics.

households. There is also a distinction between 'landless lessees' and 'non-cultivating' households with the latter including those who rent out all of their land, and in this study, are defined as absentee lessors.

To learn about cropland rental market participation, four types of households are identified (Figure 4.1), namely, pure lessee households (9.7%), households that are both lessees and lessors (0.4%), pure lessor households (7.6%), and autarkic households (82.3%). This classification is useful for the current chapter with its focus on descriptive

statistics. In Chapter 5 and Chapter 6, however, households that both rented in and rented out cropland are classified as either lessees if the net area rented in is greater than zero, and lessors otherwise.

The autarkic households are further classified as either farming households or land idle households. The latter (accounting for nearly five per cent of households with cropland) may include those who wanted to rent out their land but failed to do so. In Chapter 5, the sub-sample comprising of only farming households, which accounts for more than 92 per cent of households with cropland, are used to investigate the technical efficiency of farming households in relation to cropland rental markets.

## 4.2 Sample Characteristics

### 4.2.1 Characteristics of Rural Households with Cropland

For this study, a household is a union of persons who occupy a housing unit, pool their income and shared their food for at least six of the 12 months preceding the survey (VHLSS Manual, 2008). Households and families are basic units of analysis in demography; however, they are different. The referent of the family is kinship, while the referent of the household is propinquity or residence (Bender, 1967). Variables measured in nominal money values at different point in time are converted into real values throughout this study. Such values are expressed in constant January 2004 prices. They are also deflated by a monthly price index to allow for variations in the time of the household interviews and by a spatial price index to take account of regional price variation. The main characteristics of, and resources owned by, sample households with cropland are presented in Table 4.1. The upper part of the table details the size and structure of the household, its labour endowment and some characteristics of the household head. The lower part reports the household's assets and durable goods, income and expenditure.

Table 4.1 reports that the average size of rural households in Vietnam is declining. In 2004 the average size was about 4.4 members, while in 2008 the average household size

**Table 4.1 Summary of sample household characteristics, 2004 and 2008**

| Items | 2004 (n = 5,782) | 2008 (n = 5,648) | Change |
|---|---|---|---|
| **Household structure and human capital** | | | |
| Number of household members | 4.44 | 4.19 | -0.25*** |
| Number of working-age adults | 2.83 | 2.81 | -0.02 |
| Child dependency ratio | 0.25 | 0.21 | -0.04*** |
| Proportion of members suffering from illness | 0.40 | 0.53 | 0.13*** |
| Female headed households (%) | 18.7 | 19.1 | 0.4 |
| Age of the head (years) | 49.0 | 49.8 | 0.83*** |
| Education of the head (years) | 6.7 | 6.9 | 0.2** |
| Kinh ethnic head (%) | 85.4 | 83.9 | -1.5 |
| Head mainly working on own farm (%) | 57.6 | 57.2 | -0.4 |
| Hours self-employed of household on farm in total (%) | 57.8 | 55.8 | -2.0*** |
| Household farming experience (years) | 21.1 | 21.6 | 0.5* |
| **Assets and durable goods** | | | |
| Cropland endowment (ha) | 0.586 | 0.595 | 0.009 |
| Cropland endowment per adult equivalent (ha)[a] | 0.184 | 0.194 | 0.01 |
| Value of household assets (1000VND)[b] | 25068.3 | 31931.9 | 6863.6*** |
| Value of fixed assets (1000VND)[b] | 16971.9 | 22376.9 | 5405.0*** |
| Value of loans (1000 VND) | 4214.4 | 5343.8 | 1129.5*** |
| Household has car (%) | 0.3 | 1.0 | 0.7*** |
| Household has other motor vehicles (%) | 45.5 | 66.2 | 20.8*** |
| Household has TV (%) | 75.2 | 87.9 | 12.7*** |
| Household has radio (%) | 21.2 | 9.5 | -11.7*** |
| Household has telephone(%) | 9.4 | 55.1 | 45.7*** |
| **Income and expenditure** | | | |
| Income per adult equivalent (1000VND) | 6290.1 | 7454.7 | 1164.6*** |
| Income from agriculture in total income (%) | 43.4 | 43.5 | 0.1 |
| Income from crops in total income (%) | 33.0 | 32.7 | -0.3 |
| Income from wage remittances in total income (%) | 9.8 | 8.7 | -1.1*** |
| Expenditure per adult equivalent (1000VND) | 4740.3 | 5865.8 | 1125.5*** |
| Expenditure on food in total expenditure (%) | 53.0 | 52.1 | -0.8*** |

Source: Computed from VHLSS04 and VHLSS08.

Note: [a] The measure of adult equivalent assigns a value of 1 to the working-age adults, 0.7 to each aged member and 0.5 to each child.
[b] Value of land is not included
*, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively. Sample weights are used to compute population statistics. All values are in January 2004 prices, 1 USD = 15,730 VND.

was 4.2 members. The reduction in household size is statistically significant at the one per cent level of probability and largely ascribed to the decrease in number of the children, as shown by a fall in the child dependency ratio, which is defined as the ratio of household members under 15 years of age to household size. Causes of fertility changes are largely determined by parental motivation, reflecting rational, and in many cases, economic, decisions. Factors such as culture, social norms, religion, and tastes all play a role; yet evidence suggests that differences in economic factors as well as family planning, access to birth control and education play the major roles (Norton, Alwang and Masters, 2010). Female education is particularly important in reducing family size (Drèze and Murthi, 2001) and the survey data points toward this.

A typical rural household consists of three working-age adults (i.e. male aged 15 to 65 and female aged from 15 to 60). Male headed households account for more than 80 per cent of the sample. A typical rural household head is about 49 to 50 years old with a modest level of formal education (about seven years), suggesting that the level of human capital in farm management is generally low. However, the average household head has considerable farming experience (about 21 years). More than half (57%) of the household heads work mainly on their farms. The average rural household spends approximately 56 per cent of its pooled labour time on agricultural activities (i.e. farming and raising livestock activities). Table 4.1 also highlights a decline in the share of working hours devoted to agriculture, suggesting that more working hours are spent on non-farm jobs. This is consistent with previous findings in Vietnam, where the labour endowment of households with small farms is increasingly devoted to non-farm activities (Minot *et al.*, 2006).

As the most important natural resource for farming activities, the cropland endowment per household is very small (approximately 0.6 hectares) and fragmented (3.5 to 4.3 parcels on average). At less than 0.2 hectares per adult equivalent, the cropland endowment in Vietnam is well below the Asian region average of one to two hectares per person (Fan and Chan-Kang, 2005). The survey data also point to significant regional differences in the area of cropland per adult equivalent. Figure 4.2 shows that, with the exception of the North West region, per adult equivalent cropland endowment in the north is much lower

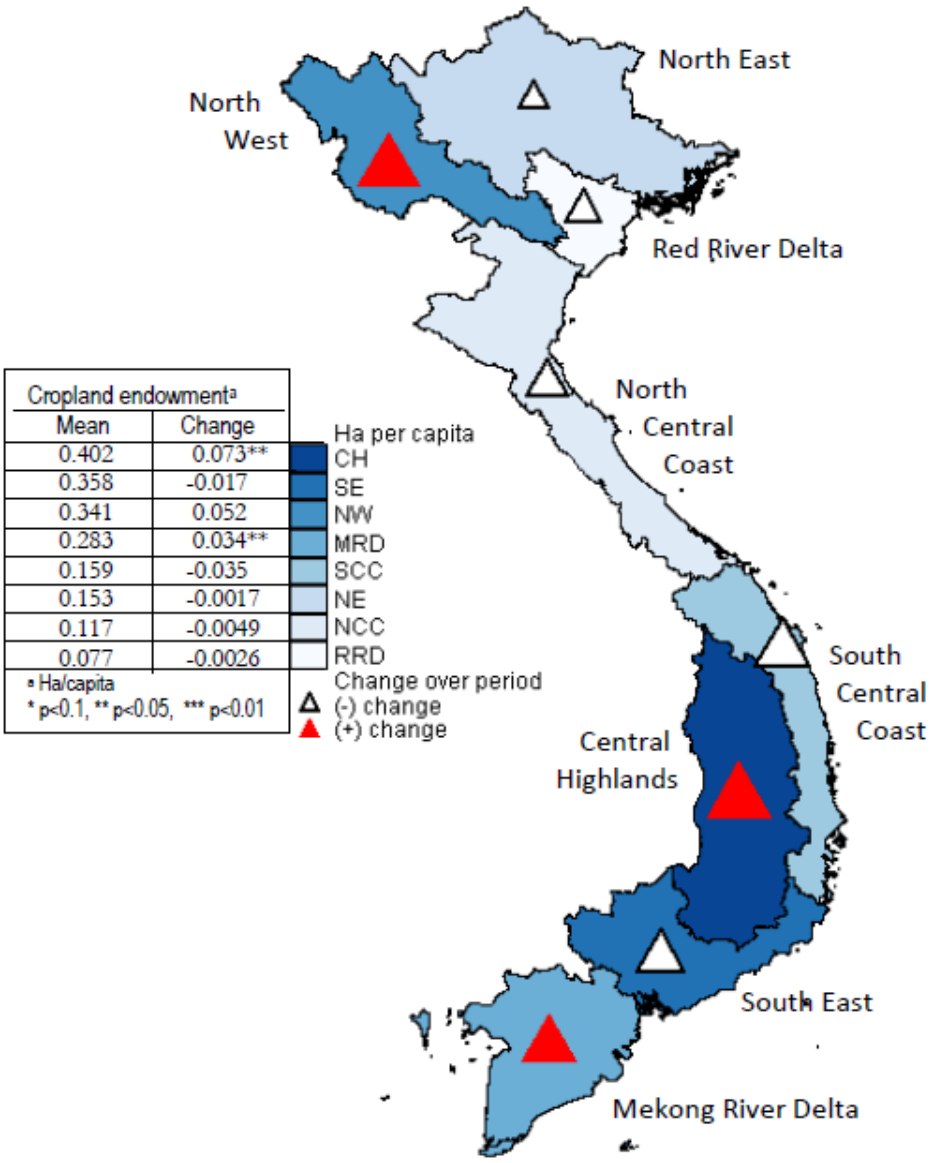


**Figure 4.2 Cropland endowments per capita by regions in Vietnam, 2004 and 2008**

Source: Computed from the pooled sample of VHLSS04 and VHLSS08. The map was created using Stata SE 11.2 with shapefile from GADM database.

Note: Sample size is 11,430. Sample weights are used to compute population statistics.
The sequential colour scheme of the base map represents the sequential estimates of per adult equivalent land endowment in eight regions of Vietnam with the darkest colour representing the greatest value and the lightest colour representing the lowest value. The triangle symbols represent the changes in per capita land endowment over the period and are drawn with size proportional to the absolute values of these estimates. The white triangle with the black border indicates negative change while the red triangle indicates positive change.

than that in the south. Despite the general reduction in household size, per adult equivalent cropland endowments increased in only three regions, namely, North West, Central Highlands and the Mekong River Delta during the period under study.

The data presented in Table 4.1 show an eight per cent increase in the real market value of fixed assets owned by rural households during the period 2004-2008. Fixed assets account for nearly 79 per cent of total household investment in assets and durable goods. Growth in fixed assets, in combination with other resources, makes it easier for households to pursue their livelihood strategies and achieve their livelihood outcomes while reducing vulnerability (Dorward, 2009).

The rural household's living standard is improving, as suggested by increased per adult equivalent income and expenditure shown in Table 4.1. The survey data also point to a decline in the proportion of household expenditure spent on food. The change is statistically significant. This finding is consistent with Engel's law. However, income from crops remains an important source of household income in rural Vietnam, accounting for about one third of total income. The overall improvement in rural living standards is also evidenced by an increase in the number of households owning motor vehicles, the substitution of televisions for radios and an almost six fold increase in the number of rural households using telephones. These changes also reflect an improvement in rural infrastructure, particularly the wide coverage of telephone networks.

### 4.2.2 Farm Characteristics

Table 4.2 contains summaries of the key attributes of sample farms and farm production. For this study, operated area is defined as the cropland endowment plus the area of cropland rented in, less the area of cropland rented out. As can be seen from Table 4.2, the average area operated by household was not significantly higher in 2008 than it was in 2004. Nevertheless, the data suggest a consolidation of parcels, indicated by a reduction in the average number of plots operated. In the Vietnam context, cropland holdings were fragmented by agrarian reforms that purposefully allocated parcels of quality and type to households (Marsh *et al.*, 2006). Reduced land fragmentation in rural Vietnam is expected to improve cost-effectiveness as explained in Section 2.2.

**Table 4.2 Farm characteristics and crop production, 2004 and 2008**

| Items | 2004 (n = 5,415) | 2008 (n = 5,186) | Change |
|---|---|---|---|
| **Farmland and farm assets** | | | |
| Operated area (ha) | 0.63 | 0.66 | 0.03 |
| Rented-in cropland in operated area (%) | 4.3 | 4.6 | 0.3 |
| Irrigated area in operated area (%) | 72.3 | 73.3 | 1.0 |
| Annual cropland area in operated area (%) | 77.0 | 76.5 | -0.5 |
| Number of operated plots | 4.15 | 3.56 | -0.59*** |
| Number of operated plots less than 100$m^2$ | 0.28 | 0.18 | -0.1*** |
| Value of farm assets (1000VND)[a] | 4809.0 | 4429.7 | -379.2 |
| Farm assets in total household assets (%) | 30.0 | 26.2 | -3.8*** |
| Farm assets per adult equivalent (1000VND) | 1507.7 | 1420.2 | -87.5 |
| Household has traction power (%), of which | 29.6 | 27.9 | -1.7 |
| - Household has draft animals (%) | 28.3 | 26.5 | -1.8 |
| Household has pesticide sprayers (%) | 3.0 | 2.1 | -0.9*** |
| Household has carts (%) | 12.5 | 9.6 | -2.9*** |
| Household has threshing machines (%) | 9.5 | 5.7 | -3.8*** |
| Household has pumps (%) | 37.7 | 48.2 | 10.5*** |
| Household applies manure (%) | 63.9 | 59.8 | -4.1*** |
| **Other inputs** | | | |
| Total expense on labour input (1000VND/ha) | 15872.9 | 20319.1 | 4446.2*** |
| Expense on hired labour (1000VND/ha) | 653.1 | 902.6 | 249.5** |
| Expense on hired traction (1000VND/ha) | 738.7 | 945.1 | 206.5*** |
| Expense on seeds and seedlings (1000VND/ha) | 1710.9 | 2319.1 | 608.2 |
| Expense on chemical and fertilisers (1000VND/ha) | 3167.9 | 4204.7 | 1036.8*** |
| Expense on other purchased inputs(1000VND/ha) | 1336.3 | 1330.9 | -5.4 |
| **Crop outputs** | | | |
| Gross output of crop production (1000VND) | 12767.4 | 14876.6 | 2109.2*** |
| Gross output per ha (1000VND/ha) | 30045.7 | 31871.8 | 1826.1 |
| Crop output in agricultural output (%) | 69.79 | 72.90 | 3.112*** |
| Livestock output in agricultural output (%) | 28.67 | 25.53 | -3.144*** |

Source: Computed from VHLSS04 and VHLSS08.

Note: [a] Value of land is not included
*, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively. Sample weights are used to compute population statistics. All values are in January 2004 prices, 1 USD = 15,730 VND.

In this study, farm moveable assets consisted mainly of tractors, draught animals, threshing machines, pesticide sprayers, carts and pumps, among others. Table 4.2 shows that there were no statistically significant differences in the real market value of farm assets per household between 2004 and 2008. However, the share of farm assets in total household assets fell by nearly four percentage points from 30 per cent in 2004 to 26 per cent in 2008 and this change is statistically significant. A decrease in the share of farm assets in total household assets including consumer durables may indicate that, on average, farm assets are less profitable than non-farm assets and that some rural households diversified their assets into non-farm activities. This is consistent with a decrease in the incidence of rural households that owned draught animals, threshing machines, pesticide sprayers and carts over the study period.

Summary statistics for the seasonal inputs and outputs are reported at the lower parts of Table 4.2. Seasonal inputs used in farm production include household labour, hired labour, seed, fertilisers, pesticides and purchased traction services. Unfortunately, most of these inputs were disaggregated only for the rice crop, so most of the seasonal expenditure variables had to be aggregated to the farm level. In this study, the total farm labour input is measured as expenditure on hired labour plus the opportunity cost of household labour. The opportunity cost of household labour was imputed by applying local average daily earnings (under piece-rate contracts in various farm tasks recorded from commune-level surveys) to the daily household labour in agriculture. With this imputation method, household members are assumed to be fully employed. Because rural households engage in agricultural activities other than crop production, the estimate of household labour was further adjusted by the percentage of crop production in total agricultural production[3]. Other crop inputs were measured in terms of their direct real annual expenditure. On the other hand, the annual gross value of crop production was estimated by first computing the output (including own-consumption) of each crop using its farm gate price, and then summing across all crops. Household crop output accounted for 70 per cent to 73 per cent of total agricultural output.

[3] Household labour units are assumed to be equally productive across crop and livestock enterprises.

## 4.3 Cropland Rental Markets in Rural Vietnam: A Descriptive Overview

### 4.3.1 The Functioning of Cropland Rental Markets

Table 4.3 reports descriptive statistics on cropland rental market participation by sample households in 2004 and 2008. Overall, the survey data show increasing use of the cropland rental market by rural households to adjust their farm sizes. For example, the

**Table 4.3 Cropland rental market (LRM) participation, 2004 and 2008**

| Items | 2004 (n = 5,782) | 2008 (n = 5,648) | Change |
|---|---|---|---|
| **Household participates in LRM (%)** | **16.9** | **18.4** | **1.4*** |
| Pure lessors in LRM (%) | 6.3 | 8.8 | 2.5*** |
| Absentee lessors (%) | 2.3 | 3.7 | 1.4*** |
| Pure lessees in LRM (%) | 10.1 | 9.3 | -0.8 |
| Landless lessees (%) | 0.8 | 1.1 | 0.4* |
| Households are both lessors and lessees (%) | 0.5 | 0.3 | -0.2* |
| **By types of cropland** | | | |
| Annual cropland | | | |
| Lessors in annual cropland LRM (%) | 6.1 | 8.3 | 2.2*** |
| Lessees in annual cropland LRM (%) | 9.9 | 8.8 | -1.1* |
| Perennial cropland | | | |
| Lessors in perennial cropland LRM (%) | 0.6 | 0.7 | 0.1 |
| Lessees in perennial cropland LRM (%) | 0.6 | 0.8 | 0.2 |
| **By types of contracts** | | | |
| Payment contracts | | | |
| Lessors with payment contract (%) | 4.5 | 6.4 | 1.9*** |
| Lessees with payment contract (%) | 6.4 | 6.3 | -0.05 |
| Lending/borrowing contracts | | | |
| Lessors with lending contract (%) | 2.6 | 2.9 | 0.3 |
| Lessees with borrowing contract (%) | 4.6 | 3.4 | -1.1*** |
| **Land autarkic household (%)** | **83.1** | **81.6** | **-1.4*** |
| Land idle households (%) | 4.2 | 5.0 | 0.8 |

Source: Computed from VHLSS04 and VHLSS08.

Note: *, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively. Sample weights are used to compute population statistics.

number of rural households participating on the supply side of the market increased by 2.5 percentage points over the study period. Interestingly, the share of lessors renting out all their cropland increased from about 36.5 per cent in 2004 to 42 per cent in 2008 suggesting that lessors are gaining confidence in the cropland rental market (LRM).

On the demand side of the cropland rental market, the share of lessee households remained at approximately ten per cent of the sample households, but the share of landless households using the rental market to access cropland increased (from approximately 8% in 2004 to nearly 12% in 2008). This does not mean that the number of landless households is rising but does suggest that the land rental market is more friendly to the poor and landless than the land sale market. Via land rental, poor and landless households can eventually progress toward the desirable goal of land ownership when the income generated through rental is gradually capitalised into land ownership (de Janvry and Sadoulet, 2001). It is also worth noting that a small group (less than 0.5%) of rural households participate in the cropland rental market as both lessors and lessees. These participants may use the rental market primarily to consolidate their farms by renting out distant parcels and renting in plots close or adjacent to their farms. Overall, this evidence suggests that the efficiency of the cropland rental market in rural Vietnam is improving and the market is creating an emerging commercial farmer class.

Figure 4.3 provides some further details of cropland rental market participation by regions. Interestingly, Red River Delta - the region with the lowest per adult equivalent cropland endowment - appears to have the most active rental market, with nearly 24 per cent of sample rural households in this region trading cropland. On the contrary, Central Highlands is the only region that experienced a decrease in participation over the study period. Figure 4.3 also presents the number of lessors relative to lessees in each region. Lessees tend to outnumber lessors in the northern regions. This may reflect much smaller farm sizes in the north and a greater need to correct imbalances in factor proportions at farm level.

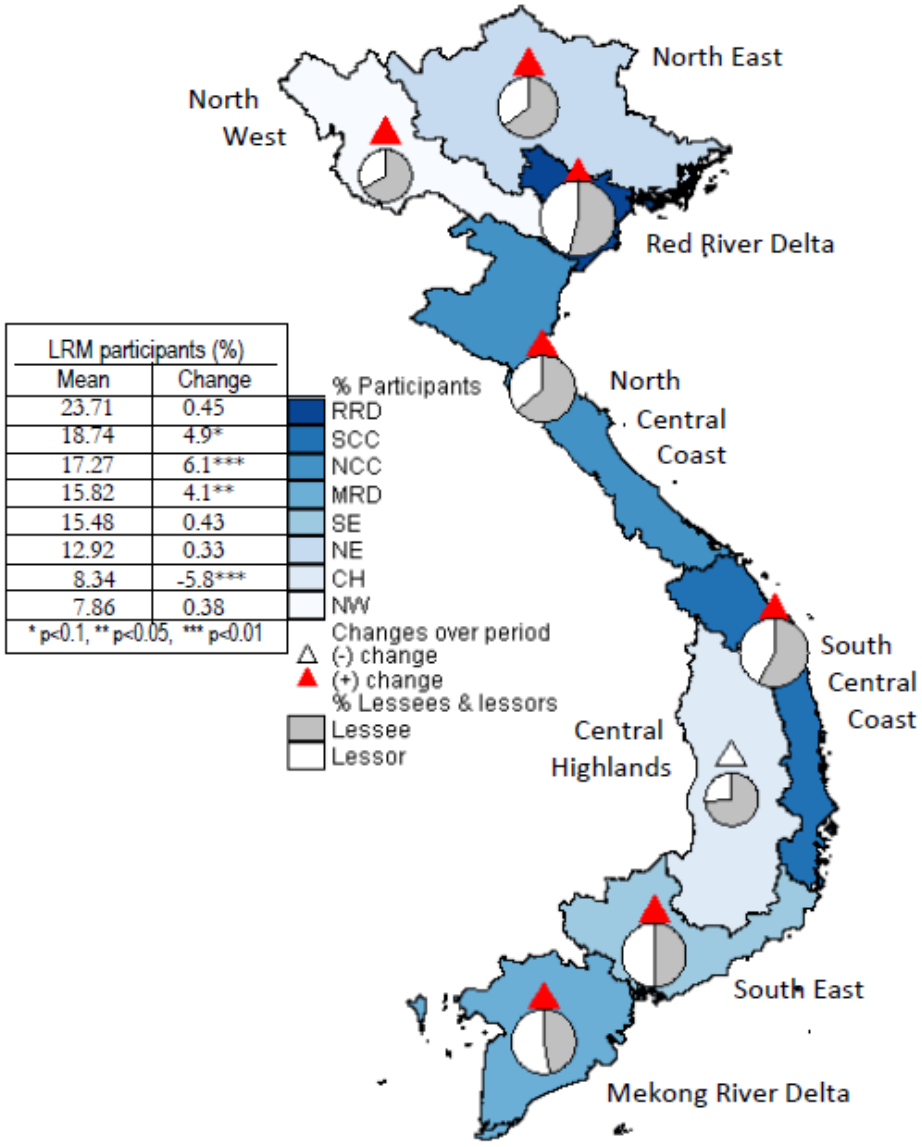


**Figure 4.3 Land rental market participation by regions in Vietnam, 2004 and 2008**

Source: Computed from the pooled sample of VHLSS04 and VHLSS08. The map was created using Stata SE 11.2 with shapefile from GADM database

Note: Sample size is 11,430. Sample weights are used to compute population statistics.
The sequential colour scheme of the base map represents sequential estimates of the share of households participating in land rental markets, with the darkest colour representing the greatest percentage and the lightest colour representing the lowest percentage. The triangle symbols indicate the direction of changes in market participants over the period. The white triangle with the black border indicates negative change while the red triangle indicates positive change. The pie charts present the shares of lessees and lessors and are drawn with size proportional to the estimates represented by the colour scheme of the base map.

The descriptive statistics presented in Table 4.3 also show that the vast majority of participants transacted annual cropland. Relatively few transacted perennial cropland. The table also shows that some rental transactions do not involve a direct payment by the lessee to the lessor. However, tenants that borrow cropland usually pay the lessors land taxes. These taxes can amount to 15-20 per cent of net crop income (Deininger and Jin, 2008). These data suggest that 'borrowing' arrangements are giving way to payment contracts. The share of lessees with borrowing contracts decreased by 1.4 percentage points while the share of lessors with payment contracts increased by nearly two percentage points over the study period.

Another indicator of cropland rental market activity is the scale of the average transactions. Table 4.4 shows that the average area of cropland rented out by lessors is 0.27 ha, while the average amount rented in by lessees is 0.32 ha. The difference between these two figures is statistically significant and suggests that lessees are consolidating land by renting in cropland from several different lessors, implying the emergence of a commercial farmer class. It is also interesting to note that the average area of cropland transacted with land use certificates is much higher for lessors (0.23ha) than for lessees (0.12ha). This suggests a perception that certification reduces the lessor's risk of losing cropland permanently when it is rented out (Thomson and Lyne, 1991).

Although there is evidence suggesting an improvement in the functioning of cropland rental markets in many parts of Vietnam, the extent of non-participation in the cropland rental market, as indicated in the bottom part of Table 4.3, is still profound, accounting for more than 80 per cent of sample households. This estimate is much higher than corresponding estimates of 54 per cent for India (Deininger, Jin and Nagarajan, 2008), 46 per cent for Eritrea (Tikabo and Holden, 2004) and 37 per cent for rural Bangladesh (Rahman, 2010). One of the explanations of non-participation in the land rental market is that transaction costs effectively drive a wedge between potential lessees and lessors (Crookes and Lyne, 2001; Lyne, 2009). This may well be the case in Vietnam where it is unlikely that all non-participating households (accounting for more than 80% of sample households) have optimal levels of all factors (both land and non-land factors). Survey

**Table 4.4 Cropland rental market transactions, 2004 and 2008**

| Items | Pure Lessor (n = 820) | Pure Lessee (n =1,096) | Difference |
|---|---|---|---|
| **Land transactions** | | | |
| No. of rented plots | 1.8 | 1.5 | -0.3*** |
| Area of rented cropland (ha) | 0.27 | 0.32 | 0.05* |
| Average rented plot size (ha/plot) | 0.22 | 0.27 | 0.05* |
| **Transaction with land use certificates (LUC)** | | | |
| No. of rented plots with LUC | 1.5 | 0.4 | -1.1*** |
| Area of rented cropland with LUC (ha) | 0.23 | 0.12 | -0.11*** |
| Share in rented area (%) | 83.7 | 29.9 | -53.8*** |
| **By types of land** | | | |
| LRM for annual cropland | | | |
| No. of rented annual plots | 1.7 | 1.4 | -0.3*** |
| Area of rented annual cropland (ha) | 0.25 | 0.30 | 0.05 |
| Share in rented area (%) | 93.3 | 93.6 | 0.3 |
| LRM for perennial cropland | | | |
| No. of rented perennial plots | 0.1 | 0.08 | -0.02 |
| Area of rented perennial cropland (ha) | 0.02 | 0.02 | -0.00 |
| Share in rented area (%) | 6.7 | 6.4 | -0.3 |
| **By types of contracts** | | | |
| Payment contracts | | | |
| No. of rented plots with payment contract | 1.2 | 1.0 | -0.2*** |
| Area of rented land with payment contract (ha) | 0.21 | 0.24 | 0.03 |
| Share in rented area (%) | 67.9 | 62.4 | -5.5** |
| Lending/borrowing contracts | | | |
| No. of plots with lending/borrowing contract | 0.63 | 0.55 | -0.08 |
| Area with lending/borrowing contract (ha) | 0.06 | 0.08 | 0.02* |
| Share in rented area (%) | 32.1 | 37.6 | 5.5** |

Source: Computed from VHLSS04 and VHLSS08.

Note: The group (less than 0.5%) of households that are both lessors and lessees are excluded. *, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively. Sample weights are used to compute population statistics.

data evidence that some four to five per cent of sample households left cropland idle also supports the argument of high transaction costs, and fixed *ex ante* transaction costs in particular owing to very small farm sizes (Crookes and Lyne, 2003).

In addition, cropland rented in accounts for a very small share (approximately 4%) of the total cropland accessed by rural households. This is much lower compared to corresponding estimates of 29.9% per cent for rural Bangladesh (Rahman, 2010). Figure 4.4 indicates the relatively small share of cropland accessed privately via cropland rental market. The shares of privately purchased cropland are three times and twice as much as those of rented-in cropland for 2004 and 2008, respectively.

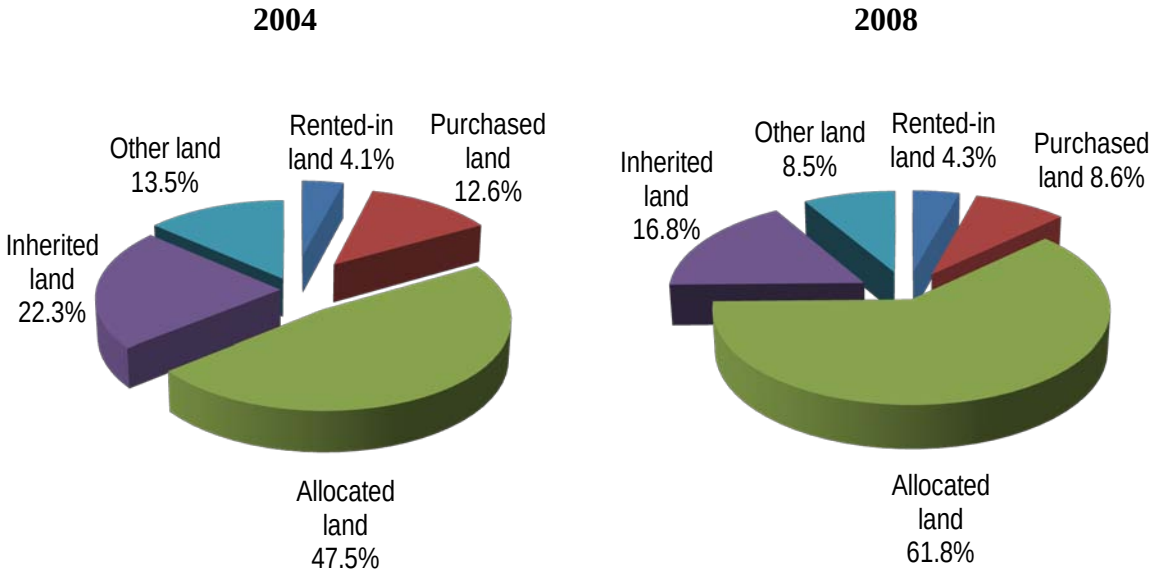


**Figure 4.4 Share of cropland area by modes of access to land, 2004 and 2008 (%)**

Source: Computed from VHLSS04 and VHLSS08 for rural households with cropland.

Note: Sample sizes are 5,782 and 5,648 for 2004 and 2008, respectively. Sample weights were used to compute population statistics.

Considering that some of this cropland may have been privately purchased by wealthy households for purposes other than farming, such as storing wealth against inflation (Sadoulet *et al.*, 2001), the minor role played by the rental market could indicate higher levels of risk (i.e. *ex post*) transaction costs associated with rental transactions.

### 4.3.2 The Outcome of Cropland Rental Markets

Table 4.5 presents summary statistics for lessors and lessees. The sample includes net lessors and lessees as defined in section 4.1.3. In general, the data support the hypothesis that land rental markets offer both efficiency and equity advantages to the participants.

The statistics in Table 4.5 show that on average, lessees are much younger than lessors and have higher level of formal education and farming experience. These are sources of human capital and are expected to impact positively on the marginal productivity of land. Lessees also have more family labour than lessors. With regard to physical capital, lessees also own more farming equipment and machinery. Despite cultivating much larger farms, they appear to apply seasonal inputs and family labour more intensively than do lessors, and even more income per hectare. However, it should be noted that these differences in the intensity of inputs applied and revenue earned are not statistically significant at the ten per cent level of probability. Clearly, the rental market is transferring cropland from households that are less able or willing to farm to those with the means and motive to make more profitable use of the land.

The data in table 4.5 also show that land rental markets transfer cropland from land 'rich' to land 'poor' households. On average, lessees own about 0.4 hectares while lessors own nearly 0.5 hectares. However, in contrast to what is observed in most developing countries, the cropland rental market in Vietnam has more than equalised the areas operated by lessees and lessors and is beginning to concentrate cropland in hands of an emerging class of larger farmers. Lessees operate an average farm size of 0.71 hectares whereas lessors operate only higher than 0.21 hectares. Another interesting observation is that a significant share of those renting out cropland are widowed household heads, accounting for about 25 per cent of sample lessors. These widows often have few means of generating farm income or are unable to farm and the rental market allows them to earn rental income or food by renting out their cropland. Furthermore, rental transactions are voluntary arrangements and the rental market offers mutual benefit to market participants without creating distress sales and the problem of a 'landless class' (Crookes and Lyne, 2003).

**Table 4.5 Summary statistics of cropland rental market outcome**

| Items | Lessor (n = 839) | Lessee (n =1,123) | Difference |
|---|---|---|---|
| **Household characteristics** | | | |
| Female headed household (%) | 34.5 | 16.7 | -17.8*** |
| Widowed female headed (%) | 24.9 | 8.3 | -16.5*** |
| Age of the head (years) | 58.2 | 43.9 | -14.7*** |
| Education of the head (years) | 6.3 | 7.3 | 1.0*** |
| Head mainly working on own farm (%) | 34.9 | 58.8 | 23.9*** |
| Farming experience (years) | 17.6 | 20.5 | 2.9*** |
| Household size | 3.3 | 4.3 | 1.0*** |
| No. of working-age adults | 2.0 | 2.7 | 0.7*** |
| Child dependency ratio (%) | 14.3 | 30.3 | 15.9*** |
| Aged adult dependency ratio (%) | 31.7 | 4.70 | -27.0*** |
| Land endowment (ha) | 0.47 | 0.38 | -0.09*** |
| Land endowment per adult equivalent (ha/AE) | 0.19 | 0.13 | -0.06*** |
| Value of farm assets (1000VND) | 3991.0 | 5135.0 | 1144.0 |
| Share of farm assets in total household assets (%) | 12.96 | 34.20 | 21.24*** |
| Value of farm assets per adult equivalent (1000VND/AE) | 1233.5 | 1701.5 | 468.0* |
| Value of farm assets per ha endowed land (1000VND/ha) | 13104.9 | 24737.1 | 11632.2*** |
| Owns draft animals (%) | 8.3 | 32.3 | 24.0*** |
| Owns tractors (%) | 0.5 | 1.9 | 1.4*** |
| Owns pesticide sprayers (%) | 1.4 | 3.2 | 1.8** |
| Owns threshing machines (%) | 2.7 | 10.8 | 8.1*** |
| Owns carts (%) | 6.0 | 18.1 | 12.1*** |
| Owns motorised vehicles (%) | 51.1 | 54.6 | 3.5 |
| Owns TVs (%) | 77.9 | 85.1 | 7.2*** |
| Owns telephones (%) | 42.7 | 31.2 | -11.5*** |
| Uses credit (%) | 37.2 | 55.2 | 18.0*** |
| **Farm production** | | | |
| Total operated area (ha) | 0.21 | 0.71 | 0.50*** |
| Total expense on labour input (1000VND/ha) | 16269.7 | 17336.3 | 1066.6 |
| Expense on hired labour (1000VND/ha) | 663.1 | 1044.5 | 381.4 |
| Expense on traction input (1000VND/ha) | 1194.8 | 1416.4 | 221.6 |
| Total expense on material inputs (1000VND/ha) | 7278.9 | 9539.0 | 2260.1 |
| Gross output value of crop production (1000VND/ha) | 33531.7 | 36972.3 | 3440.5 |

Source: Computed from VHLSS04 and VHLSS08.

Note: *, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively. Sample weights are used to compute population statistics.

## 4.4 Chapter Summary

This chapter contains a description of the data sources used for the empirical analysis and provided a preliminary examination of the overall situation of the cropland rental market in rural Vietnam. The chapter started with a description of data sources and their limitations in studying the cropland rental market. It then defined and classified populations and sub-populations of interest for this study. Next, the sample summary statistics were estimated and reported. Finally, descriptive analyses of the current situation, patterns and trends of the cropland rental market in rural Vietnam were conducted.

Overall, the survey data showed a trend of increasing use of the cropland rental market by rural households to adjust their farm sizes over the study period, although the level of market participation and the scale of transactions varied across regions. On the supply side, the share of lessors renting out all their cropland increased suggesting that lessors have been gaining confidence in the market. On the demand side, more landless households used the rental market to access cropland suggesting that the land rental market has been friendlier to the poor and landless than the land sale market.

However, the extent of non-participation in the cropland rental market was still profound, accounting for more than 80 per cent of sample households. One of the explanations of non-participation in the land rental market was that transaction costs effectively drove a wedge between potential lessees and lessors. This may well be the case in Vietnam where it is unlikely that non-participating households have had optimal levels of all factors (both land and non-land factors). Evidence from the survey data that some four to five per cent of sample households left cropland idle also supported the argument of high transaction costs, and fixed *ex ante* transaction costs in particular owing to very small farm sizes. In addition, the shares of privately purchased cropland were three times and twice as much as those of rented-in cropland for 2004 and 2008, respectively. This minor role played by the rental market could indicate higher levels of risk (i.e. *ex post*) transaction costs associated with rental transactions as compared to the cropland sale market.

Regarding market outcomes, the data supported the hypothesis that land rental markets offered both efficiency and equity advantageous to the participants. Lessees were younger than lessors and had higher level of formal education and farming experience. They also had more family labour, owned more farming equipment and machinery and applied seasonal inputs and family labour more intensively than did lessors. Viewed from an equity perspective, the data showed that the land rental market transferred cropland from land 'rich' to land 'poor' households. However, in contrast to what has been observed in most developing countries, the cropland rental market in Vietnam had more than equalised the areas operated by lessees and lessors: it has been creating an emerging commercial farmer class. In Chapter 5, a more rigorous analysis is conducted to determine whether the cropland rental market transfers land from less effective to more effective users.

# Chapter 5

# The Cropland Rental Market and Farm Efficiency

**This chapter**

* specifies a stochastic frontier model in order to measure farm technical efficiency and to examine the effect of cropland rental market participation on farm performance;
* describes variables used in the empirical model, including the determinants of farm technical efficiency; and
* estimates the empirical model and interprets the estimated results.

## 5.1 Model Specification and Estimation Methods

This chapter is concerned with measuring and explaining the farm performance of farming households and examining the effect of cropland rental market participation on this performance. For this study, farm performance is viewed as a function of the state of technology and technical efficiency. The former defines a frontier relation between resources used in the production process and corresponding outputs while the latter links waste and misallocation of resources to this frontier. Assuming that high levels of technical efficiency and hence productivity are desirable objectives, then it is important to measure and explain technical efficiency and productivity in order to provide useful information to farming households and policy makers.

Effects of the cropland rental market on the improvement of farm technical efficiency and productivity are likely to flow from the following sources: first, the rental market promotes allocative efficiency by transferring cropland from those less willing and able to farm to users that have an incentive and the means to farm (Crookes and Lyne, 2001; 2003). Second, the rental market may reduce cropland fragmentation and allow farmers to exploit scale economies, thereby improving cost efficiency (Norton, 2004; Rahman and

Rahman 2008; Wan and Cheng, 2001; Awasthi, 2009). The descriptive results presented in Chapter 4 (Section 4.3.2) provide some evidence of efficiency gains in regions of rural Vietnam where the cropland rental market is more active. This chapter presents a more rigorous evaluation of the effect of cropland rental market participation on technical efficiency for the sample of farming households.

### 5.1.1 Specification of a Stochastic Production Frontier and Technical Efficiency

The objective of farming households can be as simple as seeking to avoid waste by maximising crop outputs from a given set of inputs. This assumption is plausible for small-scale agricultural enterprises, particularly for rural Vietnam where farms are very small and subsistence oriented. In this setting, the production function approach is appropriate and widely used to analyse technical efficiency (Coelli *et al.*, 2005; Fried, Lovell and Schmidt, 2008). The production function frontier represents the maximum possible output from a given set of inputs, deviations from which can be interpreted as technical inefficiency (see also Section 3.2.3). Within this primal framework, the notion of efficiency leads to the so-called output-oriented technical efficiency (Coelli *et al.*, 2005; Fried *et al.*, 2008), and the waste avoidance objective of farming households becomes one of attaining a high degree of farm technical efficiency.

Dual approaches, such as cost minimisation or profit maximisation, are also used to analyse technical efficiency. In this study, however, the production function approach is preferred. An obvious reason is that a primal approach requires data only on outputs and inputs while a dual approach requires data on prices, which were not available for this study. The fact that the estimation of a production function does not require price information is an advantage since the market for some inputs in developing countries, such as cropland and farm labour, often do not function well enough to produce meaningful prices (Irz and Thirtle 2004). Furthermore, the dual approach requires the imposition of a normative behavioural assumption, such as profit maximisation, which is less likely to apply across all households given the complex livelihood strategies of small and subsistence farming households in developing countries (Ellis, 1998; Irz and Thirtle 2004).

Within the production function framework, there are two main competing methodologies on efficiency analysis: deterministic and stochastic frontier (Coelli *et al.*, 2005; Fried *et al.*, 2008). The deterministic data envelopment analysis (DEA) is a nonparametric approach using linear programming to measure efficiency therefore it is sensitive to outliers and data measurement errors (Coelli and Bastte, 1996; Dhungana, Nuthall and Gilbert, 2004). Studies that treat the production function as deterministic to quantify technical efficiency assume that all deviations from the frontier are associated with inefficiency. This assumption is often difficult to accept given the inherent variability of farm production due to weather, pests and diseases (Coelli and Bastte, 1996).

Furthermore, small farmers in Vietnam seldom keep accurate records and data collected on farm production are likely subject to measurement errors. To deal with this problem, a Tobit regression framework is often used after DEA estimates to explain variations in measured inefficiencies (e.g., Chavas and Aliber, 1993; Dhungana *et al.*, 2004; Vu, 2006). For example, Vu (2006) applies this approach to rice producers in Vietnam and finds that the estimate of the mean technical efficiency for rice farmers is 0.704 under constant returns to scale and 0.765 under variable returns to scale for output-oriented DEA.

On the other hand, stochastic frontier analysis (SFA) of technical efficiency, which was proposed independently by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977), is a parametric approach that accounts for noise and data measurement errors. However, SFA is also not without criticism. This approach assumes *a priori* behaviour of error terms and uses statistical techniques to estimate the parameters of the function (Coelli *et al.*, 2005; Fried *et al.*, 2008). Comprehensive reviews of the two approaches are provided by Coelli (1995), Coelli *et al.* (2005), Fried *et al.* (2008) and Bogetoft and Otto (2011). In Vietnam, SFA of technical efficiency has been applied mostly for rice farmers. For example, the mean technical efficiency of rice farmers in Vietnam was estimated at 59.2 per cent in the period 1991-1999 (Kompas, 2004), 63.4 per cent in 2004 (Vu, 2006) and 81.6 per cent in 2006 (Khai and Yabe, 2011). However, to the author's best knowledge, the SFA method has not been applied for the mixed farming system in Vietnam.

Given the alternative empirical tools available, some rigorous empirical analyses have been carried out in assessing the sensitivity of efficiency measures to the choice of DEA and SFA methodology in agriculture (e.g., Bravo-Ureta and Pinheiro, 1993; Sharma, Leung and Zaleski, 1999; Wadud and White, 2000). The evidence would suggest that the choice is somewhat arbitrary and depends upon the objectives of the research, the type of farms and assumptions regarding the data generating process (Dhungana *et al.*, 2004). This study follows the one-step stochastic frontier approach. This approach, in comparison with the data envelopment analysis (DEA), not only accounts for noise but also can be used to conduct conventional tests of hypotheses (Coelli *et al.*, 2005; Kumbhakar and Lovell, 2000; Kumbhakar, Ghosh and McGuckin, 1991).

Following Kumbhakar and Lovell's (2000) approach, a single-output stochastic production frontier model can be expressed as follows:

$$Q_h = f(X_h;\beta).\exp\{v_h\}.TE_h \qquad (5.1)$$

where

- $Q_h$ is the scalar crop output of farming household *h;*

- $X_h$ is a vector of inputs used by farming household *h;*

- $f(X_h;\beta).\exp\{v_h\}$ is the stochastic production frontier, also called 'best practice' frontier, with $\beta$ being a vector of $J+1$ technology parameters to be estimated; and

- $TE_h$ is the output-oriented farm technical efficiency of farming household *h*.

The stochastic production frontier consists of two parts: a deterministic part, $f(X_h;\beta)$, that is common to all farms, and a farm-specific part, $\exp\{v_h\}$, that reflects the effect of random shocks. In other words, $\exp\{v_h\}$ captures random variation in crop output due to factors beyond the control of households and accounts for measurement error.

From equation (5.1), output-oriented technical efficiency becomes:

$$TE_h = \frac{Q_h}{f(X_h;\beta)\exp\{v_h\}} \qquad (5.2)$$

which defines technical efficiency as the ratio of observed output to unobserved maximum feasible output under the condition of random shocks, $\exp\{v_h\}$, that vary across households. Accordingly, the farming household *h* that produces crop output of $Q_h$ achieves its maximum feasible output of $f(X_h;\beta).\exp\{v_h\}$ if, and only if, $TE_h = 1$; otherwise $TE_h < 1$ provides a measure of the deviation of observed output from maximum feasible output (Coelli *et al.*, 2005; Kumbhakar and Lovell, 2000).

A Cobb-Douglas or a translog functional form can be used to econometrically estimate technical efficiency given in equations (5.1) and (5.2). In this study, a Cobb-Douglas functional form is adopted. Although it is less flexible than the translog model, the Cobb-Douglas model has been widely used in technical efficiency analyses both in developing and developed countries (Coelli *et al.*, 2005; Bravo-Ureta and Pinheiro, 1993). Some studies have examined the impact of functional form on efficiency. For example, Kopp and Smith (1980, p. 1058) suggested that "…functional specification has a discernible but rather small impact on estimated efficiency". Taylor, Drummond and Gomes (1986) also argued that as long as interest rests on efficiency measurement, the Cobb-Douglas production function provides an adequate representation of the production technology. Furthermore, the Cobb-Douglas function is preferred in this study due to a complication of the relatively large number of inputs and their interaction terms as well as the severe multi-collinearity introduced by the interaction terms in the translog model[1].

Assume that the deterministic part, $f(X_h;\beta)$, takes the log-linear Cobb-Douglas form, then the stochastic production frontier model given in equation (5.1) can be rewritten as

$$\ln Q_h = \beta_0 + \sum_j^J \beta_j \ln X_{jh} + v_h - u_h \qquad (5.3)$$

In equation (5.3), $\beta$ is a vector of $J+1$ technology parameters; the symmetric error term, $v_h$, is associated with random shock of household *h* and is assumed to be independently

[1] The stochastic frontier was estimated using a translog production function but the translog function did not perform as well as the Cobb-Douglas function owing to collinearity problems.

and identically distributed as $N(0,\sigma_v^2)$. The $u_h$ term represents the random component associated with technical inefficiency, where

$$TE_h = \exp\{-u_h\} \tag{5.4}$$

$TE_h \leq 1$ implies that $u_h \geq 0$. A value of $u_h$ equal to zero represents perfect technical efficiency (i.e. $TE_h = 1$) while higher values of $u_h$ imply lower levels of farm technical efficiency. The term $u_h$ is often assumed to be independently (but not identically) distributed as nonnegative truncations of a general normal distribution and can be linearly expressed as

$$u_h = \delta_0 + \sum_{l}^{L} \delta_l Z_{lh} + \varepsilon_h \tag{5.5}$$

In equation (5.5), $Z_h$ is a vector of explanatory variables expected to influence technical efficiency with associated $L+1$ parameters $\delta$, and $\varepsilon_h$ is a random variable that is defined such that $u_h$ is a non-negative truncation of the $N(\delta' Z_h, \sigma_u^2)$ distribution. The condition $u_h \geq 0$ guarantees that all observations of crop output lie on or beneath the stochastic production frontier.

Early approaches that attempted to explain variation in technical efficiency through a set of exogenous variables followed a two-step procedure (Kumbhakar *et al.*, 1991). In the first step, a stochastic frontier such as equation (5.3) is estimated, temporarily ignoring explanatory variables that are supposed to explain differences in technical efficiency among farms. In the second step, the estimated technical efficiency is then regressed on these explanatory variables. Unfortunately, there are serious problems of bias with this two-step procedure (Kumbhakar *et al.*, 1991; Battese and Coelli, 1995). Wang and Schmidt (2002) further present Monte Carlo evidence showing that the bias is found at all stages of this procedure and that the bias is substantial.

This study applies the single-stage estimation model proposed by Kumbhakar *et al.* (1991) and Battese and Coelli (1993; 1995). The likelihood function and its partial derivatives with respect to the parameters of the model are provided in Battese and Coelli (1993) and Kumbhakar and Lovell (2000). Variance terms in the likelihood function are parameterised by replacing $\sigma_v$ and $\sigma_u$ with $\sigma_S^2 = \sigma_v^2 + \sigma_u^2$ and $\gamma = \sigma_u^2 / \sigma_S^2$, where the gamma parameter ($\gamma$) lies in the [0,1] interval. It is worth noting that if the inefficiency effects are not stochastic (i.e. $\gamma = 0$) and hence do not have a particular distributional specification, then the above model for the inefficiency effects cannot be estimated (Coelli and Battese, 1996). Given that the inefficiency effects are stochastic, Battese and Coelli (1995) argue that some explanatory variables can be included in both equations (5.3) and (5.5). Parameters $\beta$, $\delta$, $\sigma_S^2$ and $\gamma$ can be consistently estimated by the maximum likelihood method.

### 5.1.2 Description of Variables in the Production Function

Agricultural production depends in general on land area, irrigation, land quality, labour, farm management ability, seed, chemical fertilisers, herbicides and pesticides, animal and mechanical traction and weather, among others. Descriptive statistics computed for the variables used to estimate the stochastic frontier production function in this study are presented in Table 5.1 using pooled data for the sample of farming households from VHLSS04 and VHLSS08.

Crop output, CROPOUTPUT, is defined as the real value of the aggregated crop production (including own food consumed) evaluated at the farm gate price (see Section 4.2 for further details). Conventional inputs for crop production include land, labour, capital and materials. Using the service flow approach, the land variable SOWNAREA, is measured as the gross area (in hectares) sown once and more than once during the 12 months preceding the survey. This estimate is for all types of cropland contracts: own-cultivated land, share cropped land, and land rented-in for cash. Labour, LABOUR, is the real cost of labour used in crop production, including hired and family labour (see Section 4.2.2 for detailed discussions and the method of imputation). For those households that

**Table 5.1 Summary statistics of the variables used in the production frontier**

| Variables | Description | Mean (n = 10,548) | S.D |
|---|---|---|---|
| **Dependent variable** | | | |
| CROPOUTPUT | Gross output of crop production (1000VND) | 13,768 | 32,759 |
| **Explanatory variables** | | | |
| SOWNAREA | Gross sown area of all crops (ha) | 1.08 | 1.64 |
| LABOUR | Total expense on labour input (1000VND) | 6,356 | 6,126 |
| FARMASSET | Value of farm assets (1000VND) | 4,854 | 18,019 |
| SEED | Expense on seeds (1000VND) | 615.7 | 15,408 |
| FERTILISER | Expense on chemicals and fertilisers (1000VND) | 1,846 | 4,039 |
| OTHERINPUT | Expense on other purchased inputs(1000VND) | 623.6 | 1,785 |
| HIRELABOUR | Household hires labour (1 if yes, 0 otherwise) | 0.51 | 0.50 |
| HIRETRACTION | Household hires traction (1 if yes, 0 otherwise) | 0.52 | 0.50 |
| IRRIGATION | Irrigated area in operated area (%) | 69.98 | 37.22 |
| DELTA | Delta commune (1 if yes, 0 otherwise) | 0.50 | 0.50 |
| MIDLAND | Midland commune (1 if yes, 0 otherwise) | 0.07 | 0.26 |
| MOUNTAIN | Mountainous commune (1 if yes, 0 otherwise) | 0.39 | 0.49 |
| REGION2 | North East (1 if yes, 0 otherwise) | 0.18 | 0.38 |
| REGION3 | North West (1 if yes, 0 otherwise) | 0.07 | 0.25 |
| REGION4 | North Central Coast (1 if yes, 0 otherwise) | 0.13 | 0.34 |
| REGION5 | South Central Coast (1 if yes, 0 otherwise) | 0.09 | 0.28 |
| REGION6 | Central Highlands (1 if yes, 0 otherwise) | 0.07 | 0.26 |
| REGION7 | South East (1 if yes, 0 otherwise) | 0.07 | 0.25 |
| REGION8 | Mekong River Delta (1 if yes, 0 otherwise) | 0.16 | 0.37 |
| YEAR | Time dummy (1 if 2008, 0 otherwise) | 0.49 | 0.50 |

Source: Computed from VHLSS04 and VHLSS08.

Note: All values are in January 2004 prices, 1 USD = 15,730 VND.

engaged in both raising livestock and cultivating crops, family labour is adjusted by the percentage of crop output over total agricultural output. Farm assets, FARMASSET, are measured as the real market value of aggregate farm assets excluding the value of land. Purchased materials include seed (SEED), chemical fertilisers, herbicides and pesticides (FERTILISER), and other purchased inputs (OTHERINPUT). Given the Cobb-Douglas production functional form, estimates of coefficients on these conventional inputs are production elasticities and the signs are expected to be positive.

Draft animals and tractors play important roles in Vietnamese crop production. Possessing draft animals provides farmers vital and timely power for land preparation and transportation. Hence, it is expected that crop output is lower for households that do not possess traction power, i.e. HIRETRACTION is expected to have a negative effect on

crop output, *ceteris paribus*, because ownership of draft animals and tractors allows for more timely farming operations. Another feature of the agricultural production problem is that output depends on inputs of labour effort, not just labour time. The hypothesis that hired labour and family labour are equally productive can be tested with the coefficient on the dummy variable HIRELABOUR.

Farm productivity is also influenced by factors related to land quality. A higher share of irrigated cropland in total area operated, IRRIGATION, is expected to impact positively on crop output as irrigation improves the ability to produce consistent quantity and quality of produce. Three dummy variables, DELTA, MIDLAND and MOUNTAIN, were included to capture general land quality that systematically differs between the four topologies in which communes are located (the coastal topology is the default category). In addition, seven regional dummy variables (with Red River Delta served as the default category) were included to capture regional differences associated with climatic variability, rural infrastructure system and other factors that systematically differ between the regions. These intercept dummies allow the production frontier to shift by region and topology. Finally, the inclusion of a time dummy, YEAR, captures the possibility of Hicks-neutral technical change (Coelli, 1995; Coelli *et al.*, 2005). It may also reflect variation in weather over the study period, among other unknown time-variant factors.

### 5.1.3 Description of Variables in the Technical Efficiency Model

Technical efficiency is likely to be affected by factors that are associated with farm management practices (Coelli *et al.*, 2005; Forsund, Lovell, and Schmidt, 1980). The literature suggests that technical efficiency results from factors over which the farmer has some control such as management skills (Mundlak, 1961), the will and effort of farmers (Aigner, Lovell and Schmidt, 1977) and faming ability (Carter and Olinto, 1998). Apart from variables under farmer control, however, technical efficiency may also be affected by different exogenous variables characterising the environment in which farmers operate (Gathon and Pestieau, 1995). Examples include institutional regulations, market structure, network characteristics, and the like. Table 5.2 presents descriptive statistics for the variables used in this study to explain technical efficiency.

**Table 5.2 Summary statistics of the variables used in the technical efficiency model**

| Variables | Description | Mean (n = 10,548) | S.D |
|---|---|---|---|
| RICEZONING | Rice zoning index (ratio of rice sown area to total sown area) | 0.58 | 0.36 |
| LANDTITLED | Area with LUC in operated area (%) | 75.15 | 38.57 |
| LANDRENTED | Rented-in area in operated area (%) | 4.40 | 15.68 |
| PLOT100 | No. of operated plots less than 100 sqm | 0.22 | 0.69 |
| FARMASSET | Value of farm assets (1000VND) | 4,854 | 18,019 |
| HHLDSIZE | Adult equivalent household size | 3.17 | 1.06 |
| SELFFARM | Self-employed farmer (=1 yes, 0 otherwise) | 0.63 | 0.48 |
| HEADEDU | Education of the head (years) | 6.65 | 3.46 |
| FEMALE | Female headed household (1 if yes, 0 otherwise) | 0.17 | 0.38 |
| HEADAGE | Age of the head (years) | 48.52 | 13.38 |
| HEADAGE2 | Square of head age | 2,534 | 1,423 |
| REMITTANCE | Income from remittances (1000VND) | 1,706 | 5,395 |
| LOANVALUE | Total loan amount (1000VND) | 4,553 | 14,894 |
| EXTENSION | Visits by agricultural extension agents to commune | 8.79 | 11.08 |
| POORHHLD | Poor household (1 if yes, 0 otherwise) | 0.14 | 0.35 |
| RELIGION | Commune has diverse religions (1 if yes, 0 otherwise) | 0.56 | 0.50 |
| REMOTE | Remote commune (1 if yes, 0 otherwise) | 0.24 | 0.43 |
| FARMWAGE | Commune average farm wage (1000VND/hr) | 3.55 | 1.05 |

Source: Computed from VHLSS04 and VHLSS08.

Note: All values are in January 2004 prices, 1 USD = 15,730 VND.

The rice zoning index, RICEZONING, measured as the ratio of rice area to total sown area, intends to capture the effects of government policy that restricts the conversion of paddy fields from rice to other crop production. Many farmers find growing crops other than rice more profitable but local authorities prevent them from choosing their own crops (Markussen *et al.*, 2011; Vasavakul, 2006). Originally, the overriding concern was domestic food security and this remains an important objective (Markussen *et al.*, 2011). However, export targets are becoming increasingly important and one means of reaching these targets is to zone land only for growing rice, the most important food export (Markussen *et al.*, 2011). Restrictions are administered by commune authorities, according to a commune land use plan that is subject to approval at district level (the 2003 Land Law). Formally, households can apply for a change in land use at the district level, but, in practice, it is very difficult (Markussen *et al.*, 2011). Figure 5.1 presents some statistics on the 'rice zoning index' and the population of households growing rice in the farming household sample by regions in Vietnam. The variable RICEZONING is not an

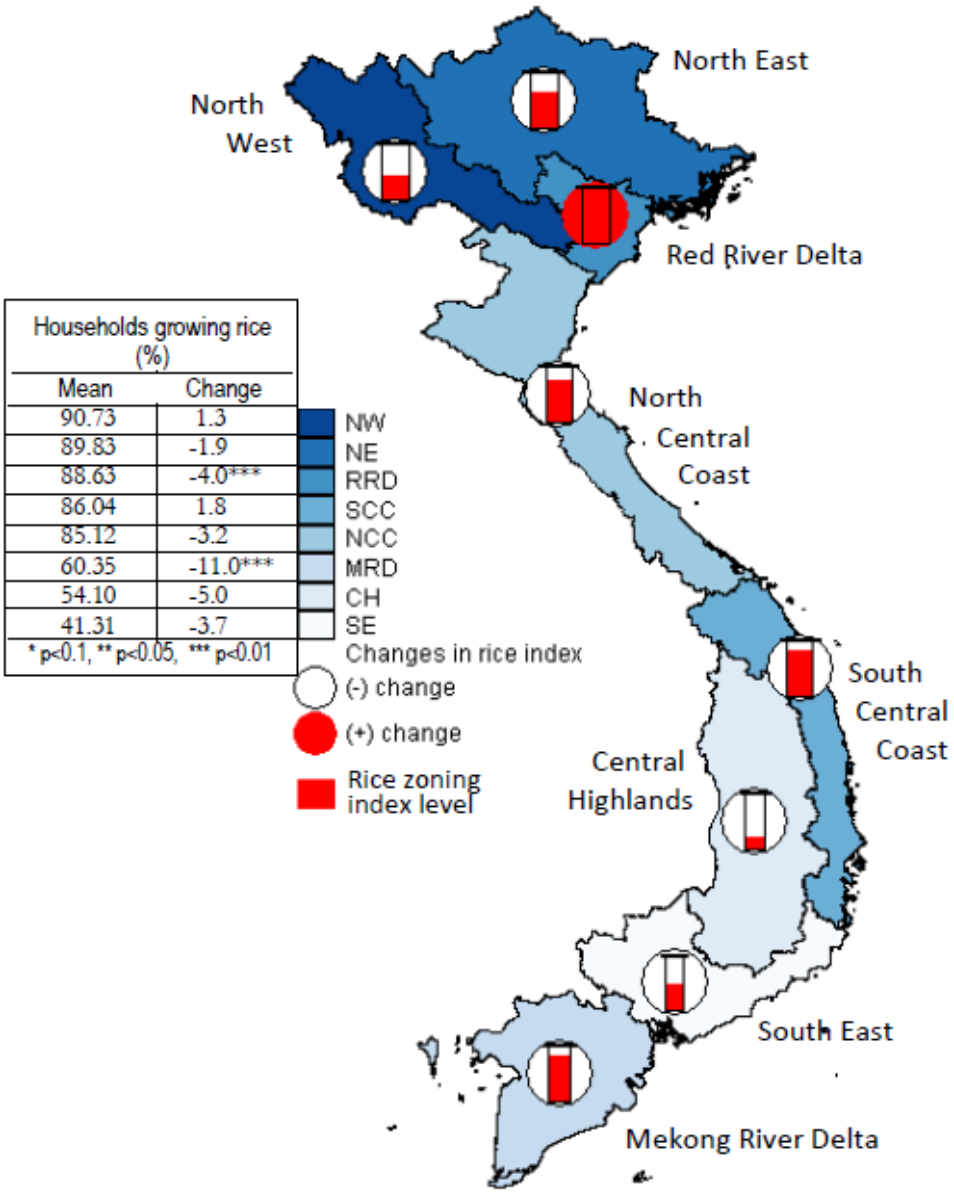


**Figure 5.1 Rice zoning index by regions in Vietnam, 2004 and 2008**

Source: Computed from the pooled sample of VHLSS04 and VHLSS08 for rural households with cropland. The map is created using Stata SE 11.2 with shapefile from GADM database.

Note: Sample size is 8,857. Sample weights are used to compute population statistics.
The sequential colour scheme of the base map represents the sequential estimate shares of households growing rice in eight regions of Vietnam with the darkest colour representing the greatest values and the lightest colour representing the lowest values. The red rectangles represent scores on a rice index with the greatest value being taken as the reference value. The rectangles with the black border represent the highest index scores and are drawn with breadth proportional to the estimates represented by the colour scheme of the base map. The circle symbols represent the changes in index scores over the period. The white circle with the black border indicates negative change while the red circle indicates positive change.

ideal measure of zoning restrictions. It is possible that, for instance, rice farmers with superior access to technology, resources, or markets may find growing rice profitable, and hence choose to devote more cropland to rice. On average, however, it is anticipated that restrictions imposed on land for rice will dampen farmers' incentives and willingness to exert more effort, and hence RICEZONING is expected to have a negative effect on farm technical efficiency.

In contrast, LANDTITLED, measured as the percentage of the area registered with land use certificates in the total operated area, is expected to have a positive effect on technical efficiency. As discussed in Section 2.1.1, land titles are intended to increase landholders' sense of tenure security, making them more likely to make land based long-term investments, improving their access to credit, and facilitating land rental transactions.

The variable LANDRENTED is defined as the percentage of rented-in area in the total operated area. This variable could have a positive or negative effect on technical efficiency. On the one hand, it is alleged that land owned and self-operated is often farmed more efficiently than rented land (Awasthi, 2009). On the other hand, for a particular farmer, the higher the value of LANDRENTED the larger the farm size. A larger farm size allows the farmer benefit from size economies and could therefore exert a positive effect on technical efficiency. The hypothesis that rented-in and owned cropland are equally productive can be tested using the coefficient estimated for LANDRENTED. In contrast, PLOT100 is a measure of land fragmentation and an increase in this variable is expected to impact negatively on technical efficiency. PLOT100 is defined as the number of operated plots less than 100 square meters in size.

Other farm and household characteristics are also expected to affect technical efficiency. Households with more farm assets are expected to face fewer obstacles in agricultural production as they have more equipment and machinery. An increase in FARMASSET is therefore expected to improve technical efficiency. Household size measured in adult equivalents, HHLDSIZE, is expected to affect technical efficiency through its effect on the household time endowment. Larger households are expected to be more technically

efficient since they have more labour available to implement farm management practices on time.

Higher levels of formal education (HEADEDU) and greater specialisation in farming (SELFFARM) of the household head are expected to improve technical efficiency. Women are more likely to struggle with farming operations that require physical strength than are men (Coelli and Battese, 1996). It is therefore expected that female headed households, FEMALE, will have lower technical efficiency.

The expected signs of the parameters in the technical efficiency model are not clear in some cases. The variable HEADAGE, the age of the farmer, could have a positive or a negative effect on technical efficiency. Older farmers are likely to have had more farming experience and hence be more efficient. However, they are also likely to be more conservative and perhaps less willing to adopt new practices. The square of this variable, HEADAGE2, is added to the model to capture non-linearity in the impact of age on technical efficiency.

Liquidity constraints may prevent farmers from operating in the rational stage of their production function. In this study, liquidity is measured by wage remittances, REMITTANCE, and use of loans, LOANVALUE. Increases in the levels of these variables are expected to impact positively on technical efficiency.

Measures of farming information and knowledge such as contacts with extension staff and participation in training courses would be useful in modelling technical efficiency, but such data were not available at the household level. Instead, the variable EXTENSION, which measures the number of visits by agricultural extension agents to the commune, is used in the model. Poor households, POORHHLD, are expected to have less social capital and hence a negative effect on their farm efficiency. This is supported by Gertler, Levine and Moretti (2006, p. 455) who found "... little support for the hypothesis that social capital is the capital of the poor". A possible explanation is that the poor are often excluded from social networks and consequently face higher information costs.

Other commune variables are included to capture the environment in which farmers operate and which are assumed to affect technical efficiency. RELIGION and REMOTE are dummy variables representing religious diversity and distance from markets respectively. Distance and differences in belief and religions tend to impede the flow of information, raising transaction costs and reducing technical efficiency. The variable FARMWAGE, representing commune average farm wage, is also expected to impact negatively on technical efficiency. As the farm wage increases, labour costs for farming activities increase. Farmers who depend heavily on hired labour have less to invest elsewhere while other farmers face higher labour opportunity costs in their farming activities.

## 5.2 Results and Discussions

### 5.2.1 Model Diagnostics

In the first step of the analysis, the Cobb-Douglas stochastic frontier production function model for crop output with technical efficiency effects specified in equation (5.3) was statistically tested against more restricted and parsimonious models. The test procedure is proposed by Battese and Coelli (1995; 1996). The first hypothesis is that the farming households are fully technically efficient or, equivalently, that the mean production function is an adequate representation of the data. This hypothesis was rejected at the one per cent level of probability in favour of the Cobb-Douglas stochastic frontier production function model with the technical inefficiency component $u_h$. Further, a test for the null hypothesis which specifies that the inefficiency effects are not stochastic (i.e. $\gamma = 0$) was strongly rejected at the one per cent level of probability. Finally, the hypothesis that the coefficients of the explanatory variables in the model for the inefficiency effects are simultaneously zero was tested and rejected at the one per cent level of probability (the test procedures and results are reported in Appendix C). Multi-collinearity diagnostics for the stability of the model were also analysed. The means of variance inflation factor (VIF) for the stochastic frontier and technical efficiency models were 2.25 and 6.21, respectively. As suggested by Belsley, Kuh and Welsch (2004), an explanatory variable

whose VIF value is greater than ten may merit further investigation. All of the explanatory variables used to estimate the model had VIFs less than ten, with the exception of the variables HEADAGE and HEADAGE2 that are anticipated (see Appendix C). This suggests that the estimated model is free of any serious multi-collinearity. Maximum likelihood estimates of the models expressed in equations (5.3) and (5.5) were obtained using Stata11.2SE. Estimated parameters of the stochastic frontier and technical efficiency models are presented in Table 5.3 and 5.5 respectively.

### 5.2.2 Estimates of the Production Function Frontier

The estimated coefficients of the stochastic frontier have signs and sizes that generally conform to prior expectations, as can be seen from Table 5.3. The overall model quality, as judged by the t-ratios, is satisfactory. All estimated coefficients on input variables are significant, at least at the ten per cent level of probability, except for some of the regional dummy variables and the variable HIRETRACTION.

The estimate of production elasticity for land (0.79) is the largest, being nearly 1.5 times the estimated elasticities with respect to labour, farm assets and purchased materials. This estimate compares favourably with production elasticities of 0.81 estimated for farmers in Norway (Lien, Kumbhakar and Hardaker, 2007), 0.76 for wheat farmers in eastern England (Wilson, Hadleyand Asby, 2001), and 0.87 for UK potato growers (Wilson, Hadley, Ramsden and Kaltsas, 1998). Regarding land quality, the estimated coefficient of IRRIGATION is positive and statistically significant, conforming to prior expectations. Most of the irrigation systems in rural Vietnam were publicly funded during the period of collectivisation and are still managed by local government. Topologies (DELTA, MIDLAND and MOUNTAIN) associated with land quality play an important role in crop production. On average, the land quality in the coastal area is less productive than other areas, as suggested by the positive coefficients estimated for the delta, midland and mountainous areas.

The estimate of production elasticity for farm labour is approximately 0.19, which is close to an estimate of 0.21 for rural households in China (Zhang, Wang, Glauben and

**Table 5.3 Estimates for the parameters of the stochastic production frontier**

| Variables | Description | Coefficients | Std. Err. |
|---|---|---|---|
| lnCROPOUTPUT | **Ln gross value of crops output** | | |
| lnSOWNAREA | Ln Gross sown area of all crops | 0.79*** | (0.0144) |
| lnLABOUR | Ln Total expense on labour input | 0.19*** | (0.00508) |
| lnFARMASSET | Ln Value of farm assets | 0.009* | (0.00490) |
| lnSEED | Ln Expense on seeds and seedlings | 0.026*** | (0.00300) |
| lnFERTILISER | Ln Expense on chemical and fertilisers | 0.18*** | (0.00377) |
| lnOTHERINPUT | Ln Expense on other purchased inputs | 0.18*** | (0.00430) |
| HIRELABOUR | Household hires labour (1 if yes, 0 otherwise) | 0.091*** | (0.00872) |
| HIRETRACTION | Household hires traction (1 if yes, 0 otherwise) | - 0.016 | (0.0101) |
| IRRIGATION | % irrigated area in operated area | 0.0012*** | (0.000139) |
| DELTA | Delta commune (1 if yes, 0 otherwise) | 0.10*** | (0.0195) |
| MIDLAND | Midland commune (1 if yes, 0 otherwise) | 0.064*** | (0.0237) |
| MOUNTAIN | Mountainous commune (1 if yes, 0 otherwise) | 0.091*** | (0.0214) |
| REGION2 | North East (1 if yes, 0 otherwise) | -0.095*** | (0.0164) |
| REGION3 | North West (1 if yes, 0 otherwise) | -0.029 | (0.0221) |
| REGION4 | North Central Coast (1 if yes, 0 otherwise) | -0.14*** | (0.0143) |
| REGION5 | South Central Coast (1 if yes, 0 otherwise) | -0.11*** | (0.0163) |
| REGION6 | Central Highlands (1 if yes, 0 otherwise) | -0.0017 | (0.0220) |
| REGION7 | South East (1 if yes, 0 otherwise) | -0.022 | (0.0202) |
| REGION8 | Mekong River Delta (1 if yes, 0 otherwise) | 0.041** | (0.0162) |
| YEAR | Time dummy (1 if 2008, 0 otherwise) | 0.020** | (0.00939) |
| CONS | Constant | 4.56*** | (0.0573) |
| Obs | Observations | 10,601 | |
| sigma2 | $\sigma_S^2 = \sigma_v^2 + \sigma_u^2$ | 0.153 | |
| gamma | $\gamma = \sigma_u^2 / \sigma_S^2$ | 0.037 | |
| LL | Log Likelihood | -4907.5 | |

Source: Computed from VHLSS04 and VHLSS08.

Note: Ln is the natural logarithm.
Standard errors are in parentheses.
*, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively.

Brümmer, 2011). The estimated coefficient on HIRELABOUR is positive and statistically significant, suggesting that hired labour is more productive than family labour. The estimated coefficient of HIRETRACTION is negative, as was expected, but its t-value (1.58) is not statistically significant at the ten per cent level of probability. The lowest production elasticity is estimated for farm assets, FARMASSET. This is not surprising as the average value of farm assets is only 309 USD (Table 5.1) and these farm assets tend to be simple like hand hoes and buffalo carts.

Regional dummy variables are assumed to capture differences associated with climatic variability, rural infrastructure system and other factors that systematically differ between regions. Crop output was found to be lower in all regions, except the Mekong River Delta, when compared to the Red River Delta.

The returns to scale value of 1.4 is obtained from the summation of the coefficients of estimated production elasticities. This suggests that farms in the study area are in stage one of the production frontier, which is characterised by increasing returns to scale. This suggests that farms in Vietnam are constrained as profit could be increased by adding more of all inputs in the long run. Other studies have found similar results. For example, the mean returns to scale was estimated at 1.68 for small scale yam based farmers in Nigeria (Ojo, Mohammed, Ojo and Olaleye, 2009) and 1.2 for maize farmers in Thailand (Nonthakot and Villano, 2008).

The coefficient on the year of observation in the stochastic frontier is estimated to be statistically significant and positive at a yearly rate of five per cent. This estimate may be assigned to a Hicks-neutral technical change, indicating reasonable growth in productivity over the period. However, the estimated coefficient may also capture some variation in weather over time and other unknown time-variant factors.

### 5.2.3 Prediction of Technical Efficiency

The prediction of technical efficiency was computed for the sample of farming households using an output-oriented measure as in equation (5.4). Before discussing the technical efficiency results, it is important to consider the estimate of gamma ($\gamma$) in Table 5.3. As mentioned in Section 5.2.1, if the inefficiency effects are not stochastic (i.e. $\gamma = 0$), then the mean production function is an adequate representation of the data. The null hypothesis that the inefficiency effects are not stochastic was rejected at the one per cent level of probability (see Appendix C). This suggests that the random component of the inefficiency effects was present in the analysis of crop production in the sample involved. Although the gamma parameter ($\gamma$) cannot be interpreted as the proportion of the variance of the inefficiency effects relative to the sum of the variances of the inefficiency effects

and the random variation of the production frontier (Battese and Coelli, 1996), its estimate (0.037) is relatively small.

The estimate of the average technical efficiency for the sample was 0.85. This suggests that reasonable gains in crop production can still be achieved by improving farm management practices under existing technologies. It also reveals the challenge and potential for improving crop production in Vietnam. The result is also consistent with a lower estimate of 0.82 for households growing rice in Vietnam (Khai and Yabe, 2011), where rice is often considered less productive in comparison with other crops.

However, the predicted efficiencies differed substantially among farmers, ranging from 0.58 to 0.98 with the median of 0.86. To give a better indication of the distribution of the individual efficiencies, a frequency distribution of the estimated efficiencies for the sample of farming household is plotted in Figure 5.2.

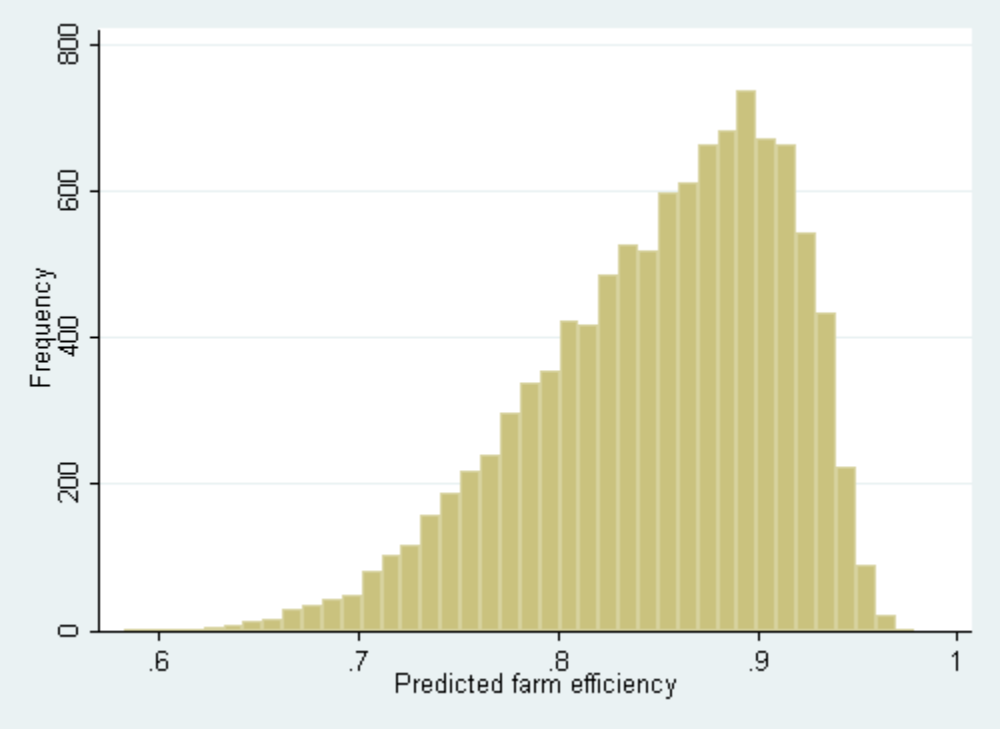


**Figure 5.2 Frequency distribution of technical efficiency for the sample of farming households**

Source: Computed from VHLSS04 and VHLSS08. The graph was created using Stata SE 11.2.

### 5.2.4 Land Rental Market Participants and Technical Efficiency

One indicator of efficiency in the cropland rental market is the ability of the market to transfer land from less effective to more effective users (Crookes and Lyne, 2001; 2003). Differences between the technical efficiency of lessees and lessors therefore shed some light on the efficiency of the cropland rental market. Table 5.4 presents the estimates of the mean and median of technical efficiency for observed lessees and lessors.

**Table 5.4 Means and medians of predicted technical efficiency**

| Items | Mean TE | Median TE |
|---|---|---|
| Whole sample | 0.85 | 0.86 |
| By LRM regimes in cropland rental markets | | |
| Lessor households | 0.80 | 0.80 |
| Lessee households | 0.86 | 0.87 |

Source: Computed from VHLSS04 and VHLSS08.

On the cropland supply (i.e. lessor) side, the average of estimated technical efficiency of participants was 0.80. On the cropland demand (i.e. lessee) side, the estimate was 0.86. The difference between the technical efficiency of lessees and lessors is statistically significant at the one per cent level of probability. This suggests that, on average, lessees are technically more efficient than lessors by a margin of six percentage points. This finding is consistent with theory and with findings of earlier research by, for instance, Thomson and Lyne (1991), Crookes and Lyne (2001), and Lohmar, Zhang and Somwaru (2001). The implication is that the land rental market in rural Vietnam is 'doing the right things' by transferring land to farmers who are 'doing things right'. Hence, promoting the cropland rental market by reducing transaction costs is important for facilitating the allocation of cropland to achieve higher levels of efficiency in land use and agricultural productivity.

The predicted efficiencies, however, differed within each market regime. Figures 5.3 and 5.4 present the frequency distributions and kernel density of technical efficiency for lessees and lessors. The predicted efficiencies of lessor farming households ranged from 0.59 to 0.97 and the shape was quite balanced and centred at the mean of 0.80, as can be

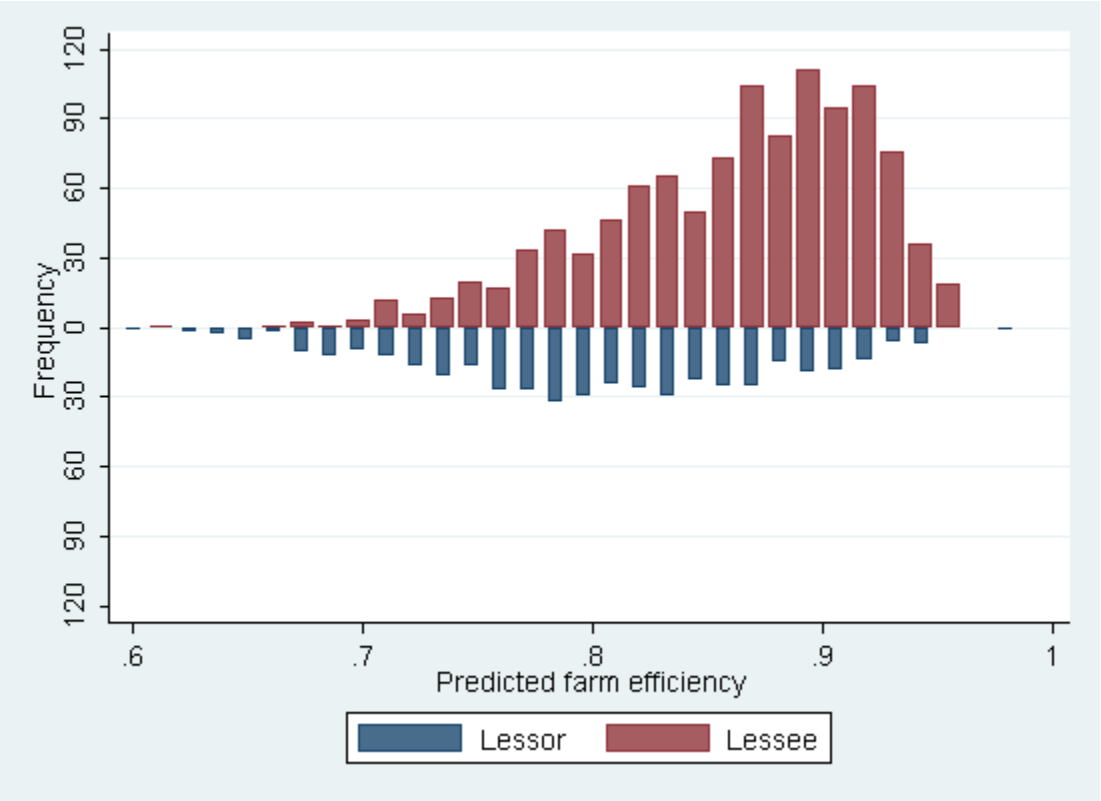


**Figure 5.3 Frequency distributions of technical efficiency for lessees and lessors**

Source: Computed from VHLSS. The graphs were created using Stata SE 11.2.

seen from Figure 5.4. On the other hand, the predicted efficiencies of lessee farming households ranged from 0.61 to 0.96 and the distribution was skewed to the left (bunched up toward the right with a 'tail' stretching toward the left).

When the focus is on what happens 'on average' or perhaps 'typically', the mean is appropriate if the distribution is symmetrical, and especially when it is 'mound-shaped', such as a normal distribution (Gujarati, 2004). In such a case, the mean is in the middle and values near the mean are typical. If a distribution is skewed, however, the mean is usually not in the middle and a better measure of the centre for this distribution would be the median (Gujarati, 2004). In the case of the predicted efficiencies of lessee, the median (0.87) is greater than the mean (0.86) and this is common for a distribution that is skewed to the left. However, this difference is very minor.

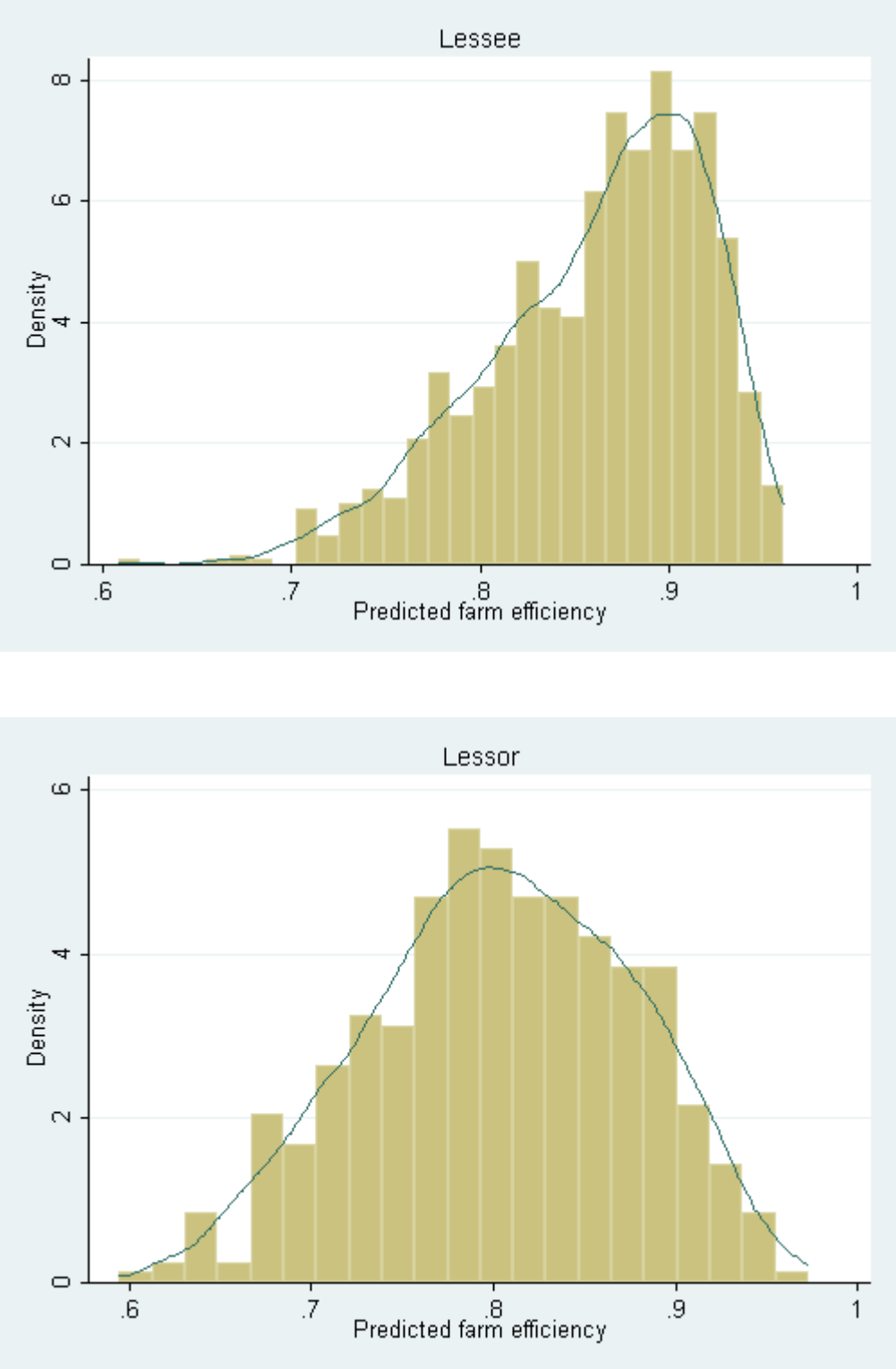


**Figure 5.4 The kernel density of technical efficiency for lessees and lessors**

Source: Computed from VHLSS. The graphs were created using Stata SE 11.2.

### 5.2.5 Determinants of Technical Efficiency

The estimated coefficients in the technical efficiency model are of particular interest to this study. Recall from equations (5.4) and (5.5) that

$$TE_h = \exp\{-u_h\} \text{ and } u_h = \delta' Z_h + \varepsilon_h$$

where $TE_h$ is the output-oriented technical efficiency of farming household *h*, $Z_h$ is a vector of variables assumed to influence technical inefficiency with associated parameters $\delta$. Since $\exp\{.\}$ is a monotonic function, a negative sign for parameter $\delta_j$ indicates an improvement in technical efficiency. However, the magnitude effect on technical efficiency is not straightforward and should be interpreted with care (Coelli *et al.*, 2005). In the first step, a test for the linear technical efficiency specification as in equation (5.5) was conducted. The null hypothesis that the coefficients of the explanatory variables in the model for the inefficiency effects are simultaneously zero (and hence that the technical inefficiency effects have the same truncated-normal distribution) was rejected at the five per cent level of probability (see Appendix C). This indicates that the joint effects of the variables explaining technical efficiency are significant, although the individual effects of some variables may not be statistically significant. Estimated parameters of the technical efficiency model are presented in Table 5.5. For ease of interpretation, all estimated coefficients of technical efficiency model are multiplied by negative one.

In general, the estimated coefficients of all variables have signs that conform to prior expectations. The coefficient of the rice zoning index, RICEZONING, is estimated to be negative, suggesting that zoning land only for rice production reduces technical efficiency. Kurosaki (2008) reported similar results for rice farmers in Myanmar showing that the area share under non-profitable paddy crops was higher for farmers who were under tighter control of the local administration. However, the estimated coefficient for the rice zoning index in this study is not statistically significant at the ten per cent level of probability although its t-value is greater than unity (1.07).

**Table 5.5 Estimates for the parameters of the technical efficiency model**

| Variables | Description | Coefficients | Std. Error |
|---|---|---|---|
| TE | Technical efficiency | | |
| RICEZONING | Rice zoning index | -0.022 | (0.0206) |
| LANDTITLED | Area with LUC in operated area (%) | 0.00030** | (0.000131) |
| LANDRENTED | Rented-in area in operated area (%) | 0.00055* | (0.000328) |
| PLOT100 | No. of operated plots less than 100 sqm | -0.024*** | (0.00636) |
| lnFARMASSET | Ln Value of farm assets (1000VND) | 0.0030 | (0.00545) |
| HHLDSIZE | Adult equivalent household size | 0.013** | (0.00585) |
| SELFFARM | Self-employed farmer (=1 yes, 0 otherwise) | 0.0075 | (0.0108) |
| HEADEDU | Education of the head (years) | 0.0045*** | (0.00164) |
| FEMALE | Female headed household (1 if yes, 0 otherwise) | -0.051*** | (0.0122) |
| HEADAGE | Age of the head (years) | 0.00046 | (0.00237) |
| HEADAGE2 | Square of head age | -0.000012 | (0.0000218) |
| REMITTANCE | Income from remittances (1000VND) | 1.67e-06* | (9.87e-07) |
| LOANVALUE | Total loan amount (1000VND) | 1.40e-07 | (4.24e-07) |
| EXTENSION | Visits by agricultural extension agents to commune | -0.00063 | (0.000409) |
| POORHHLD | Poor household (1 if yes, 0 otherwise) | -0.089*** | (0.0138) |
| RELIGION | Commune has diverse religions (1 if yes, 0 otherwise) | -0.024** | (0.0116) |
| REMOTE | Remote commune (1 if yes, 0 otherwise) | -0.037*** | (0.0134) |
| FARMWAGE | Commune average farm wage (1000VND/hr) | -0.058*** | (0.00559) |
| CONS | Constant | 0.0022 | (0.0815) |
| | Observations | 10,601 | |

Source: Computed from VHLSS04 and VHLSS08.

Note: Dependent variable is technical efficiency estimated in a single stage procedure together with the frontier function and estimated using Stata 11.2SE. Coefficients are multiplied by minus one for ease of interpretation.
Ln is the natural logarithm.
Standard errors are in parentheses.
*, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively.

The coefficient estimated for LANDTITLED, is statistically significant and positive, as expected. This suggests that technical efficiency is higher on cropland that is registered with a land use certificate. This finding is consistent with the result of previous research by Kariuki, Ritho and Munei (2008) and Otsuki, Reis and Hardie (1999) that the process of land registration should be extended to enhance farm technical efficiency.

Importantly, the coefficient estimated for the variable LANDRENTED is positive and statistically significant. This finding indicates that farmers who rent in more cropland are more effective land users than other farming households. Furthermore, in the context of

rural Vietnam where virtually all households have access to cropland and farm sizes are uniformly small, the positive estimate of LANDRENTED coefficient may also reflect gains from economies of scale, as explained earlier (see Section 5.1.3).

The coefficient of PLOT100 is estimated to be negative and statistically significant. This implies that farmers with less fragmented land operate at higher levels of technical efficiency. The result supports Hung *et al.*'s (2007) earlier findings for Vietnam and is in line with findings from Bangladesh (Rahman and Rahman, 2008), India (Monchuk, Deininger and Nagarajan, 2010) and South Asia (Niroula and Thapa, 2005).

Coefficients estimated for farm assets (FARMASSET) is positive but not statistically significant. As explained above, this is not surprising as the average value of farm assets is only 309 USD and these farm assets tend to be simple like hand hoes and buffalo carts. The coefficient of household size, HHLDSIZE (measured in adult equivalents), is estimated to be positive and significant, indicating that larger households and households with relatively fewer dependants are more technically efficient. One reason for this may be that these households have more labour endowment available for timely farm management practices. The coefficient for the variable SELFFARM (i.e. self-employed farmers) is estimated to be positive, indicating that specialisation in farming of the household head tends to improve technical efficiency. However, this coefficient is statistically insignificant.

For the household head, formal education, HEADEDU, measured in terms of years of schooling, has a positive and statistically significant effect on technical efficiency. This result is consistent with results for farmers in Kenya (Kariuki *et al*., 2008), India (Coelli and Battese, 1996) and China (Zhang *et al.*, 2011). The significant and negative coefficient estimated for the variable FEMALE supports the view that female headed households are less technically efficient than their male counterparts. The coefficient for the variable HEADAGE (i.e. the age of the farmer) is estimated to be positive, indicating that older farmers tend to be more efficient. However, this coefficient is statistically insignificant.

The coefficients estimated for REMITTANCE and LOANVALUE are both positive. The former is significant at the ten per cent level of probability. As expected, farmers with higher levels of liquidity tend to be more technically efficient. Surprisingly, the number of visits by agricultural extension agents to the commune (EXTENSION) has no significant effect on farmers' technical efficiency. A possible explanation is that insufficient qualified staff and poor coordination and management are the major problems to limit the efficiency of agricultural extension in Vietnam (De, Uchiyama and Ohara, 2005). Poor households tend to be less technically efficient, as suggested by the negative and significant coefficient estimated for the POORHHLD variable. As explained earlier, the poor are often excluded from social networks and consequently face higher information costs. The estimated coefficients of other commune dummy variables (RELIGION, REMOTE and FARMWAGE) also have negative effects on technical efficiency, consistent with prior expectations.

## 5.3 Chapter Summary

Land rental market development has important implications for crop production. This chapter investigated the technical efficiency in crop production and examined the effect of land rental market participation on technical efficiency, using the farming household data from VHLSS04 and VHLSS08. A one-step stochastic frontier approach was applied to overcome the misspecification of efficiency levels.

The estimated results showed that the production function exhibited increasing returns to scale with the elasticity for land being the largest of the estimated elasticities, suggesting that an expanding farm size leads to higher returns to land in the long run. In this sense, a promotion of access to land through the land rental market to consolidate farmland is vital.

The estimate of the average technical efficiency for the sample was 0.85, suggesting that reasonable gains in crop production (15%) could still be achieved under the existing technologies. Households renting in land achieved higher technical efficiency, indicating that the cropland rental market facilitated an efficient allocation of cropland by

transferring cropland from less effective users to more effective farmers. The results therefore suggest that policies to stimulate the development of the cropland rental market could contribute significantly to crop production in Vietnam. Another finding highlighted the process of land registration in order to enhance farmer incentives to make land based long-term investments, and to facilitate land rental transactions.

The results also showed that policies that have imposed restrictions on land use rights, particularly land for growing rice, may have negative effects on technical efficiency. However, a more rigorous analysis of these zoning restrictions will require more robust data. Another limitation was related to the strong assumptions about the behaviour of error terms that facilitate the use of the one-step stochastic frontier approach. However, the study so far has not addressed factors that affect household decisions to participate in the cropland rental market. Chapter 6 reports on investigation of this issue.

# Chapter 6

# Transaction Costs and Participation in the Cropland Rental Market

**This chapter**

* introduces and specifies a generalised ordered logit model accounting for the household market regime with thresholds that shift as a function of transaction costs associated with market participation;
* describes variables used in the empirical model, including indicators of transaction costs that affect participation in, and hence the efficiency of, the cropland rental market in rural Vietnam; and
* estimates the empirical model and interprets the estimated results.

## 6.1 Model Specification and Estimation Methods

When there are significant scale economies in agricultural production or imperfections in markets for agricultural production factors, there exists, for each farmer, an optimal operational farm size that may not correspond to the farmer's current land endowments (Binswanger *et al.*, 1995; Sadoulet *et al.*, 2001). Accordingly, rural households participate in cropland rental markets in order to correct imbalances in factors of agricultural production at the farm level, given their existing endowments of land (Teklu and Lemi, 2004). Low transaction costs are vital for cropland rental markets to function efficiently (Lyne and Thomson, 1998).

This chapter is concerned with identifying and understanding transaction costs that affect participation in, and hence the efficiency of, the cropland rental market in rural Vietnam. The findings presented in Chapter 5 show that the cropland rental market in rural Vietnam has 'done the right things' by shifting cropland from less effective to more effective farming households. The descriptive statistics presented in Chapter 4 also point to the equity advantages of this market. At the same time, these descriptive statistics reveal that

an unusually large proportion (>80%) of the farming households have not used the rental market and that many households leave their cropland idle. Given that improvements in the functioning of the cropland rental market would help to promote social equity and the efficiency of land use, it is important to identify the determinants of transaction costs and to understand their existence and significance. To achieve this goal, an econometric model accounting for the impact of transaction costs on market participation is specified and estimated. However, the current study does not attempt to empirically measure the absolute size of transaction costs. This is almost impossible as transaction costs are often unobserved, indirect, and are not all quantified (in terms of time, money, and other factors) (Goetz, 1992; Key *et al.*, 2000).

### 6.1.1 A Generalised Ordered Choice Model for Cropland Market Participation

The cropland rental market faces constraints derived either from the characteristics of the cropland itself, such as being an immobile resource, or from the economic environment, such as land tenure arrangements and physical infrastructure. All of these factors, together with the relevant cultural and socio-political environments, affect the rental market and its ability to solve the land allocation problem (Trivelli, 1997).

In the absence of transaction costs, the market rent is determined by the intersection of the supply of available cropland to the market and the demand for cropland for agricultural production. The demand for cropland, in turn, derives from the value of the marginal product of cropland which is the value of the agricultural production that can be attributed to the next unit of cropland (implicit land rent). The value of the marginal product of cropland, which can be derived from the production function, is the product of the marginal productivity of cropland for the production of certain crops and their market prices. Hence, a lessee is willing to pay rent based only on the result of the agricultural production process because he or she receives only the benefits derived from using the land as a productive factor (Trivelli, 1997; Binswanger *et al.*, 1995). (A land buyer may additionally consider, for instance, expectations about a change in the value of land caused by inflation or by changes in opportunity costs in other economic sectors.) For this study,

the value of the marginal product of cropland is defined as the net return to land, accounting for the income remaining after paying for all productive factors and inputs (except land) involved in the agricultural production process. Let $e(\bullet)$ be a well-behaved net income function with $e'(\bullet)$ being the first derivative with respect to cropland, and let $\tilde{S}_h$ denote the potential value of the marginal product of cropland for household *h* in cropland autarky (see Figure 3.2). Then $\tilde{S}_h$ can be written as a linear expression of $e'(\bullet)$ as:

$$\tilde{S}_h = e'(X_h) = \alpha + X_h\beta + \varepsilon_h \tag{6.1}$$

where $\tilde{S}_h$ is assumed to be continuous and take values from -∞ to +∞; $\alpha$ is the intercept; $X_h$ is a ($K$×1) vector of explanatory variables with $\beta$ being a ($K$×1) vector of associated parameters; and $\varepsilon_h$ is the random error term.

In the presence of transaction costs associated with cropland rental market participation, the costs cause a gap between rented-in and rented-out prices, creating a 'price band' (Crookes and Lyne, 2003; Key *et al.*, 2000). As introduced in Chapter 3 and repeated here for convenience, let $r_h(TRC^i)$ denote the effective rent paid by household *h* written as a function of transaction costs, which equals the market rent plus transaction costs associated with renting in land; and $r_h(TRC^o)$ denote the effective rent received by household *h* written as a function of transaction costs, which equals the market rent minus transaction costs associated with renting out land. Accordingly, the 'price band' implies that $r_h(TRC^i) - r_h(TRC^o) > 0$ and this gap is an indicator of the size of transaction costs when using the market (see Figure 3.2). In the presence of transaction costs, some studies on land market participation allow a farming household to participate in both sides of the market and its decisions to do so are implicitly assumed to be independent of each other (e.g., Kung, 2002; Teklu and Lemi, 2004; Vranken and Swinnen, 2006; Masterson, 2007; Holden *et al.*, 2007). Farming households may behave this way when the opportunity costs resulting from cropland fragmentation (e.g. time spent travelling between plots, transport costs, and limitations imposed on machinery usages) are higher than transaction

costs incurred when participating in both sides of the rental market in order to consolidate land parcels. For this study, however, it is assumed that a household cannot simultaneously be both a lessee and a lessor, given the existence of transaction costs. The assumption is reasonable in the Vietnam context where there only about 0.4 per cent of households in the sample participate in both sides of the cropland rental market.

With the existence of transaction costs, a rural household's decision on market participation is based on its potential value of marginal product of cropland under land autarky and transaction costs associated with market participation. The household is assumed to become a lessor if its potential value of marginal product of cropland is lower than the effective rent received, i.e., $\tilde{S}_h < \mathrm{r}_h(TRC^0)$. In contrast, the household becomes a lessee if its potential value of marginal product of cropland is higher than the effective rent paid, i.e., $\tilde{S}_h > r_h(TRC^i)$. Finally, the household does not participate in the market if its potential value of marginal product of cropland lies between the effective rent received and the effective rent paid, i.e., $r_h(TRC^o) \le \tilde{S}_h \le r_h(TRC^i)$. In other words, no land adjustment occurs inside the 'price band' (Figure 3.2).

Being an abstract construct, the potential value of the marginal product of cropland for household *h* in cropland autarky, $\tilde{S}_h$, is an underlying continuous but latent process. However, the outcome of the household's decision on market status (i.e. being a lessor, non-participant, or lessee) can be observed. The discussion in the preceding paragraph suggests that there are only three mutually exclusive and collectively exhaustive regimes of the cropland rental market that can be ranked in order of the latent value of land's marginal productivity, $\tilde{S}_h$, for farming household *h*. Accordingly, the observed market participation regime for farming household *h* can be tied to the latent variable $\tilde{S}_h$ by a non-linear probability model of ordinal outcomes in a form:

$$R_h = \begin{cases} =1 \text{ for the lessor regime} & \text{if } -\infty < \tilde{S}_h \le \mu_1 \\ =2 \text{ for the autarkic regime} & \text{if } \mu_1 < \tilde{S}_h \le \mu_2 \\ =3 \text{ for the lessee regime} & \text{if } \mu_2 < \tilde{S}_h \le +\infty \end{cases} \qquad (6.2)$$

where $R_h$ is an index taking on values of 1, 2 and 3 in ascending order; $\mu_1 = r_h(TRC^o)$ and $\mu_2 = r_h(TRC^i)$ are thresholds parameters (or cut-points).

It is worth noting that the difference between two levels of ordering scale (i.e. lessors compared to the autarkic, and the autarkic compared to lessees) is not the same on the scale of $\tilde{S}_h$. The focus of this type of model is on the order response probabilities, $\Pr(R_h = j \mid X)$, $j$= 1, 2, 3; not on $\mathrm{E}(\tilde{S}_h) = \alpha + X_h\beta$ as $\tilde{S}_h$ is an abstract construct. For instance, equation (6.2) shows that household *h* is observed to be in the autarkic regime (i.e. $R_h = 2$) when $\mu_1 < \tilde{S}_h \leq \mu_2$. This implies that $\Pr(R_h = 2 \mid X_h) = \Pr(\mu_1 < \tilde{S}_h \leq \mu_2 \mid X_h)$. Furthermore, the actual values taken on by the dependent variable $R_h$ (i.e. 1, 2 and 3 in this case) are irrelevant, except that they reserve the order, i.e. larger values are assumed to correspond to 'higher' outcomes (Long and Freese, 2001; Greene and Hensher, 2010). Hence, the thresholds $\mu_1$ and $\mu_2$, which are equations also to be estimated, importantly capture this strictly non-linear transformation (Greene and Hensher, 2010).

As is often found in the literature, either a standard binary, or multinomial or ordered logit (probit) model is commonly applied to study the determinants of market participation. The multinomial logit (probit) model, however, may not be appropriate for cases similar to equation (6.2) (i.e. where the dependent variable has more than two outcomes that can be ranked in order) because the multinomial model ignores information about the order of the market regimes being tied to the latent process $\tilde{S}_h$ that affects the household's decision on its market position. Another problem with the multinomial logit (probit) model is that it includes possibly many more parameters than are necessary and increases the risk of getting insignificant results since the model frees all explanatory variables from the parallel-lines constraint (Williams, 2006). The potential loss of efficiency in using models for nominal outcomes is large when the model should be analysed as ordinal (Long and Freese, 2001). The standard ordered logit (probit) model also faces some issues. While taking information on the ranking order of outcomes into account, the analysis of the marginal probability effects is to a large extent predetermined by the restrictive parametric

structure of the model (Boes and Winkelmann, 2006; Greene and Hensher, 2010) and the model often suffers from the parallel regression assumption (Long and Freese, 2001; Williams, 2006). In order to demonstrate this point, and to subsequently introduce a generalised ordered logit model with thresholds that are allowed to vary as a function of transaction costs associated with market participation, consideration is first given to a standard ordered logit model. Alternatively, an ordered probit model can also be of interest. However, the ordered probit model is analytically much less tractable than the ordered logit model (Cramer, 2003).

Assuming that the random error term $\varepsilon_h$ in equation (6.1) has a standard logistic distribution with cumulative distribution function:

$$\Lambda(t) = \Pr(\varepsilon_h \leq t) = \exp(t)/[1+\exp(t)]$$

From equations (6.1) and (6.2), it follows that[1]:

$$\begin{aligned} &\Pr(R_h > j \mid X_h) = \Pr(\tilde{S}_h > \mu_j \mid X_h) = \Pr[\varepsilon_h > \mu_j - (\alpha + X_h\beta) \mid X_h] = \\ &= G(-\mu_j + \alpha + X_h\beta) = \frac{\exp(-\mu_j + \alpha + X_h\beta)}{1+\exp(-\mu_j + \alpha + X_h\beta)} \end{aligned} \tag{6.3}$$

where $j = 1,\ 2$. Since the intercept $\alpha$ and the constant term of thresholds $\mu_j$ cannot be identified simultaneously, it is assumed, without loss of generality, that $\alpha = 0$. Then, the probabilities that $R_h$ taking on values of 1, 2 and 3 can be determined as:

$$\begin{aligned} &\Pr(R_h = 1 \mid X) = 1 - G(-\mu_1 + X_h\beta) \\ &\Pr(R_h = 2 \mid X) = G(-\mu_2 + X_h\beta) - G(-\mu_1 + X_h\beta) \\ &\Pr(R_h = 3 \mid X) = G(-\mu_2 + X_h\beta) \end{aligned} \tag{6.4}$$

The model described in equation (6.4) is a parallel-lines model, known in the econometric literature as the proportional odds model. In this model the vector of coefficients, $\beta$, is the same for all values of *j*, except the intercept (or thresholds), $\mu_j$. Changing the intercept shifts the probability curve to the right or to the left, but it does not change the

[1]The function is written in this way in order to facilitate later comparisons among models. The cumulative distribution function is: $\Pr(R_h \leq j \mid X) = \Lambda(.) = 1 - G(.)$.

slopes (Long and Freese, 2001). It is in this sense that the regression curves are parallel. It is common for at least one coefficient of the explanatory variables to differ across the ordinal categories of the dependent variable; hence the parallel assumption is often violated and is a key problem with the parallel-lines model (Long and Freese, 2001; Williams, 2006; Greene and Hensher, 2010). Fortunately, the generalised ordered logit model (i.e. the partial proportional odds model) can overcome these limitations, as discussed by Williams (2006). In the generalised ordered logit model, some of the $\beta$ coefficients can differ, while others can be the same for all values of *j*. For instance, in the following generalised ordered logit with two explanatory variables:

$$\Pr(R_h > j \mid X_h) = \frac{\exp(-\mu_j + X1_h\beta_1 + X2_h\beta_{2j})}{1+\exp(-\mu_j + X1_h\beta_1 + X2_h\beta_{2j})} \tag{6.5}$$

the coefficient $\beta_1$ for $X1$ is the same for all values of *j* while $\beta_{2j}$ for $X2$ are allowed to differ across *j*. To detect if the assumption of the parallel-lines model is met, the Brant test can be employed. However, it is unclear what the alternative hypothesis should be in this context (Greene and Hensher, 2010). Alternative tests available include Wald or Likelihood Ratio tests that can give more control over model specification and testing (Williams, 2006). Accordingly, both a global test for the model specification and individual tests for a variable or a group of variables can be conducted to check the parallel-lines assumption.

It is also important to note that the standard ordered logit model (equation 6.3) assumes the same set of fixed thresholds (or cut-points) for every individual in the sample. For this study, however, the assumption is relaxed so that it allows the thresholds (or cut-points) to depend on a number of proxy variables for transaction costs. As discussed earlier, transaction costs associated with market participation affect a household's decision on its market position. In particular, a household that does not use the market to transact finds the disutility resulting from the cost of a transaction through market exchange greater than the utility gained by transacting (de Janvry *et al.*, 1991; Key *et al.*, 2000). In other words, transaction costs - and hence the market regime of a household (which is tied to the household's latent productivity of cropland) - are household specific. Accordingly, for the

same level of the potential value of marginal product of cropland, the probability of an individual household responding in any given market regime may be different across the sample. Another way of expressing this is that the thresholds, which importantly capture the strictly non-linear transformation of the household's market regimes, are allowed to differ for every individual in the sample (Figure 6.1, see also Figure 3.2).

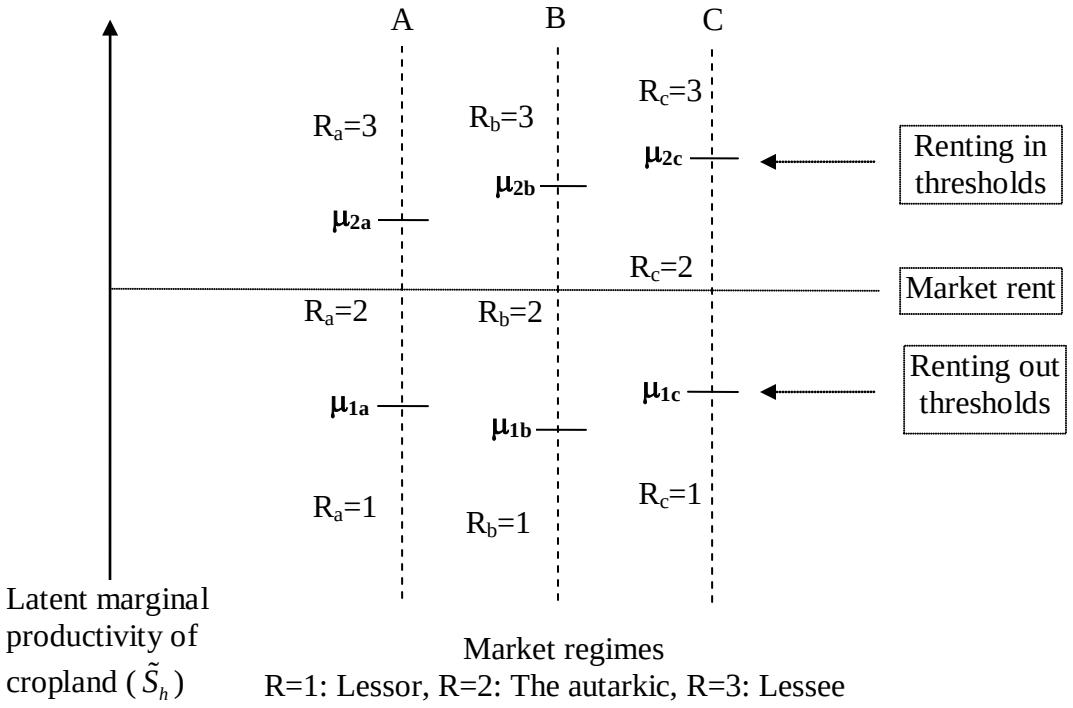


**Figure 6.1 Mapping from unobserved productivity of cropland to observed market regimes in the presence of transaction costs**

For the empirical analysis, it is assumed that the thresholds can be expressed as linear functions of proxy variables for transaction cost and can be written as:

$$\mu_{1h} = r_h(TRC^o) = \gamma_0^o - Z_h^{TRC}\gamma^o \tag{6.6a}$$

$$\mu_{2h} = r_h(TRC^i) = \gamma_0^i + Z_h^{TRC}\gamma^i \tag{6.6b}$$

where $Z_h^{TRC}$ is a vector of proxy variables for transaction costs assumed to influence threshold levels for household *h* with associated parameters $\gamma$; the superscripts *o* and *i* indicate renting out or renting in cropland, respectively. Although it is difficult to observe

and record all transaction costs associated with market participation (Key *et al.*, 2000), there are a certain number of observable factors that can explain the costs as discussed in Chapter 2. Substituting equations (6.6a) and (6.6b) into (6.5) gives a generalised ordered logit model with shifting thresholds. For this study, the model is employed to identify and understand the transaction costs that are assumed to affect the decision of household participation in the cropland rental market in rural Vietnam. The model, with associated parameters of $\beta$ and $\gamma$, can be estimated using the maximum likelihood method (Williams, 2006).

### 6.1.2 Variables Explaining the Motive for Market Participation

As discussed in Section 6.1.1, in this study the farming household's motive to participate in the cropland rental market is influenced by $\tilde{S}_h$, the potential value of its marginal product of cropland. Given the technology available, the marginal product of cropland, in turn, is expected to depend on the household's own endowments of cropland, farm capital, family labour resource for farming activity and non-farm employment, farming knowledge and skills, land quality and other production factors (see also the discussion in Section 2.3). Table 6.1 defines variables used in the empirical model and presents descriptive statistics computed for these variables using pooled data from the VHLSS04 and VHLSS08 for the sample of rural households that farm or that have farmland.

Cropland endowment is one of the most important natural resources used in farming. However, it would be quite unusual for a household's current cropland endowment to match its optimal farm size (Binswanger *et al.*, 1995; Sadoulet *et al.*, 2001). The variable ENDOWAREA measures the area of cropland currently owned by a rural household. For the same level of non-land factors, a larger endowment of cropland is expected to have a positive effect on the propensity to supply cropland to the rental market. In contrast, rural households that are poor in land relative to their farm assets and labour are likely to participate on the demand side of the rental market. The quality of cropland is another factor that directly relates to land productivity and hence affects the household's decision to rent in or rent out cropland (Teklu and Lemi, 2004). Three dummy variables capture

**Table 6.1 Summary statistics of variables explaining the motive for land rental market participation**

| Variables | Description | Lessors (n=820) | Non-participants (n=9,514) | Lessees (n=1,096) | Overall mean (n = 11,430) | S.D |
|---|---|---|---|---|---|---|
| MKTREGIME | Cropland rental market regimes | 1 | 2 | 3 | 2.03 | 0.41 |
| ENDOWAREA | Cropland endowment (ha) | 0.51 | 0.70 | 0.40 | 0.66 | 1.14 |
| ENDOWPLOT | No. of endowed cropland plots | 3.50 | 3.70 | 3.50 | 3.60 | 2.66 |
| DELTA | Delta commune (1 if yes, 0 otherwise) | 0.71 | 0.48 | 0.61 | 0.51 | 0.50 |
| MIDLAND | Midland commune (1 if yes, 0 otherwise) | 0.06 | 0.07 | 0.06 | 0.07 | 0.26 |
| MOUNTAIN | Mountainous commune (1 if yes, 0 otherwise) | 0.19 | 0.40 | 0.28 | 0.37 | 0.48 |
| HHLDSIZE | Adult equivalent household size (persons) | 2.54 | 3.20 | 3.08 | 3.14 | 1.07 |
| CHILDDEPCY | Child dependency ratio | 0.15 | 0.24 | 0.30 | 0.24 | 0.22 |
| WIDOW | Widow-headed household (1 if yes, 0 otherwise) | 0.24 | 0.11 | 0.09 | 0.12 | 0.32 |
| HEADAGE | Age of the head (years) | 57.84 | 48.80 | 43.89 | 48.98 | 13.77 |
| HEADAGE2 | Square of head age | 3,603 | 2,562 | 2,058 | 2,589 | 1,480 |
| HHLDEDU | Education of the household (yrs) | 8.57 | 9.08 | 9.31 | 9.06 | 2.90 |
| EXPERIENCE | Farming experience of the household (yrs) | 15.56 | 21.66 | 20.60 | 21.11 | 12.67 |
| SELFFARM | Self-employed farmer (1 yes, 0 otherwise) | 0.35 | 0.61 | 0.60 | 0.59 | 0.49 |
| EXTENSION | Visits by agricultural extension agents to commune | 9.58 | 8.79 | 8.35 | 8.81 | 11.05 |
| FARMWAGE | Commune average farm wage (1000VND/hr) | 3.82 | 3.54 | 3.70 | 3.58 | 1.05 |
| FARMASSET | Value of farm assets (1000VND) | 4,238 | 4,660 | 5,147 | 4,677 | 17,740 |
| REMITTANCE | Income from remittances (1000VND) | 3,017 | 1,728 | 1,548 | 1,805 | 5,767 |
| LOANVALUE | Total loan amount (1000VND) | 6,542 | 4,489 | 5,572 | 4,746 | 16,508 |
| REGIONCPI | Regional CPI (in January 2004 prices, Rural Red River Delta =1) | 1.02 | 1.03 | 1.02 | 1.03 | 0.04 |
| REGION2 | North East (1 if yes, 0 otherwise) | 0.10 | 0.18 | 0.15 | 0.17 | 0.37 |
| REGION3 | North West (1 if yes, 0 otherwise) | 0.02 | 0.07 | 0.03 | 0.06 | 0.24 |
| REGION4 | North Central Coast (1 if yes, 0 otherwise) | 0.11 | 0.13 | 0.16 | 0.13 | 0.34 |
| REGION5 | South Central Coast (1 if yes, 0 otherwise) | 0.09 | 0.09 | 0.09 | 0.09 | 0.28 |
| REGION6 | Central Highlands (1 if yes, 0 otherwise) | 0.02 | 0.07 | 0.05 | 0.07 | 0.25 |
| REGION7 | South East (1 if yes, 0 otherwise) | 0.07 | 0.07 | 0.06 | 0.07 | 0.26 |
| REGION8 | Mekong River Delta (1 if yes, 0 otherwise) | 0.20 | 0.18 | 0.13 | 0.18 | 0.38 |
| YEAR | Time dummy (1 if 2008, 0 otherwise) | 0.57 | 0.49 | 0.47 | 0.49 | 0.50 |

Source: Computed from VHLSS04 and VHLSS08. All values are in January 2004 prices, 1 USD = 15,730 VND.

land quality that is assumed to differ systematically across the four topologies in which sample households are located, viz. DELTA, MIDLAND and MOUNTAIN. The coastal topology serves as the default category. Land fragmentation, which results in cost-inefficiency, is another important characteristic of farmland in rural Vietnam and is assumed to have a negative impact on cropland productivity (Hung *et al.*, 2007). The number of cropland plots owned by the household, ENDOWPLOT, is therefore included in the model to capture the effect of cropland fragmentation across households.

Family labour, farming ability and household characteristics (a household's production decisions are affected by its consumption requirement) are also determinants of the household's farming activities that influence its marginal product of cropland and hence its decision to participate in the cropland rental market. Family size measured in adult equivalents, HHLDSIZE, child dependency ratio, CHILDDEPCY, and marital status of the household head, WIDOW (scoring one if the household head is a widow, and zero otherwise) represent the household's labour endowment and its demographic composition. Farm management capacity is represented by the age of the household head, HEADAGE, education, HHLDEDU (measured as the number of years of formal schooling attained by the most educated household member), farming experience, EXPERIENCE (measured as the maximum number of years worked by any household member on the farm), and specialisation in farming, SELFFARM (scoring one if the household head is a self-employed farmer, and zero otherwise). Extension services, EXTENSION, measured as the number of visits made by agricultural extension agents to the commune, are included as these services should provide human capital-enhancing inputs, as well as flows of information (Anderson and Feder, 2007). The opportunity cost of family labour is represented by the commune average farm wage, FARMWAGE. The variables HHLDSIZE, CHILDDEPCY, HHLDEDU, EXPERIENCE, SELFFARM and EXTENSION are expected to impact positively on the decision to rent in land. In contrast, WIDOW is expected to have a negative effect on renting in land. The expected effect of HEADAGE on cropland productivity, and hence rental market participation, is not obvious (Coelli and Battese, 1996). On the one hand, younger farmers may accumulate knowledge and skill as they age, which would likely lead to higher marginal productivity.

On the other hand, older farmers may be less likely to adopt new technology and practices, keeping land productivity low. For these reasons, a quadratic age term (HEADAGE2) is added to account for the possibility of a non-linear age effect.

To capture the effect of physical and financial capital on the motive for renting in or renting out cropland, both farm assets and sources of liquidity are included in the model. The household's farm assets, FARMASSET, are measured as the real market value of farm assets excluding the value of owned land. The availability of cash to finance land rental and other inputs is expected to increase the household's propensity to hire additional cropland (Vranken and Swinnen, 2006). Sources of liquidity considered are the real income from remittances, REMITTANCE, and the total real value of loans, LOANVALUE, that the household negotiated with both formal and informal lenders. Given that the demand side of the rental market comprises mainly of land-constrained farming households, it is anticipated that the decision to rent in land will be positively influenced by the value of a household's farm assets and its liquidity. Conversely, on the supply side of the cropland rental market, a negative relationship is expected.

As the value of the marginal product of cropland and hence market participation is also affected by output market prices, a regional consumer price index, REGIONCPI (the value in January 2004 prices with the rural area of the Red River Delta as the base region), is used to control for differences in levels of output market prices across regions. Regional dummy variables for seven Vietnam regions, REGION2 to REGION8 (Red River Delta is the default region), are also included to control for differences in rural infrastructure, weather and other unobserved factors that vary systematically across regions. Finally, the inclusion of the year of observation, YEAR (scoring 1 if the year is 2008, 0 otherwise), is expected to capture the possibility of Hicks-neutral technological change as well as the variation in climate and weather over the study period, among other unknown time-variant factors that are assumed to affect the marginal product of cropland and hence the household's decision on market participation.

### 6.1.3 Proxy Variables for Land Tenure and Transaction Costs

Transaction costs associated with market participation may prevent rural households from engaging in cropland rental transactions (Crooks and Lyne, 2003; Lyne, 2009). Transaction costs can be usefully divided into *ex ante* and *ex post* components (Williamson, 1985). *Ex ante* transaction costs are mainly fixed costs associated with the costs of searching for, obtaining and screening information about markets, potential partners and characteristics of the good or service traded; negotiating and bargaining for the best price; and drafting and safeguarding contracts (Lyne, 2009; Skoufias, 1995). The *ex post* component, on the other hand, relates to the costs of monitoring, renegotiating and enforcing contracts, and variable costs associated with losses or risk of losses caused by a breach of contract (Lyne, 2009). While fixed transaction costs can often be seen as the first barrier to overcome if the household is to take part in the cropland rental market (Goetz, 1992; Key *et al.*, 2000), these costs, together with variable transaction costs, affect the level of market participation, the type of contracts drawn and volumes traded (Lyne, 2009).

There is also evidence of asymmetry in transaction costs incurred by lessees and lessors when using the cropland rental market (Thomson and Lyne, 1991). For example, lessors often have to bear the additional transaction costs stemming from the risk of losing land rights. As indicated in the literature review, asymmetries in transaction costs may stem from the potential problems of moral hazard and adverse selection in cropland rental arrangements (Thomson and Lyne, 1991; Bell and Sussangkarn, 1988). To highlight these features of transaction costs on the cropland rental market, the empirical model employed in this study not only attempts to account for transaction costs, it also attempts to test for asymmetries in transaction costs on both side of the market. Although most transaction costs are not directly observed and measured in household surveys, it is possible to observe some factors that determine transaction costs. Table 6.2 presents definitions and descriptive statistics for proxy measurement of transaction costs in the cropland rental market drawn from the VHLSS04 and VHLSS08 data for the sample of rural households that have farmland.

**Table 6.2 Summary statistics for variables explaining sources of transaction costs**

| Variables | Description | Mean (n =11,430 ) | S.D |
|---|---|---|---|
| ENDOWTITLED | Share of endowed cropland area with LUC (%) | 76.5 | 38.8 |
| RICEZONING | Rice zoning index (ratio of rice sown area to total sown area) | 0.54 | 0.38 |
| LANDDISPUTE | Commune has land conflicts and disputes (1 if yes, 0 otherwise) | 0.37 | 0.48 |
| OWNPHONE | Household owns a telephone (1 if yes, 0 otherwise) | 0.31 | 0.46 |
| RADIOSTATION | Commune has a radio relay station (1 if yes, 0 otherwise) | 0.77 | 0.42 |
| OWNVEHICLE | Household owns a motorised vehicle (1 if yes, 0 otherwise) | 0.56 | 0.50 |
| CMNROAD | Commune has all-weather roads (1 if yes, 0 otherwise) | 0.62 | 0.49 |
| CMNMARKET | Commune has a local market (1 if yes, 0 otherwise) | 0.61 | 0.49 |
| ETHNICITY | Commune has diverse ethnic groups (1 if yes, 0 otherwise) | 0.55 | 0.50 |
| RELIGION | Commune has diverse religions (1 if yes, 0 otherwise) | 0.57 | 0.50 |

Source: Computed from VHLSS04 and VHLSS08.

The literature review (Section 2.5.1) suggests that transaction costs in cropland rental markets are strongly influenced by land tenure security. In the economic sense, land tenure security is defined in terms of the breadth, duration and assurance of land rights (Place *et al.*, 1994) and tenure security is expected to be inversely related with transaction costs (Lyne *et al.*, 1997; Lyne, 2009). Some authors argue that, within indigenous land tenure systems, tenure security can be enhanced and transaction costs reduced through gradual adaptations of customary land rights (Lyne and Thomson, 1998; Lyne, 2009). In Vietnam, however, the government attempted to strengthen tenure security by introducing new land laws and land titling programmes (see Section 2.1 for a discussion). Figure 6.2 reports some statistics on the registration of land use right certificates (LUC) and the share of titled cropland by region in Vietnam for rural households with cropland in the pooled sample of VHLSS04 and VHLSS08.

The primary objective of land law reforms in Vietnam was to promote economic efficiency of land use, although equity was also taken into account (Do and Iyer 2008; Ravallion and van de Walle, 2008). Land titles have often been viewed as a precondition

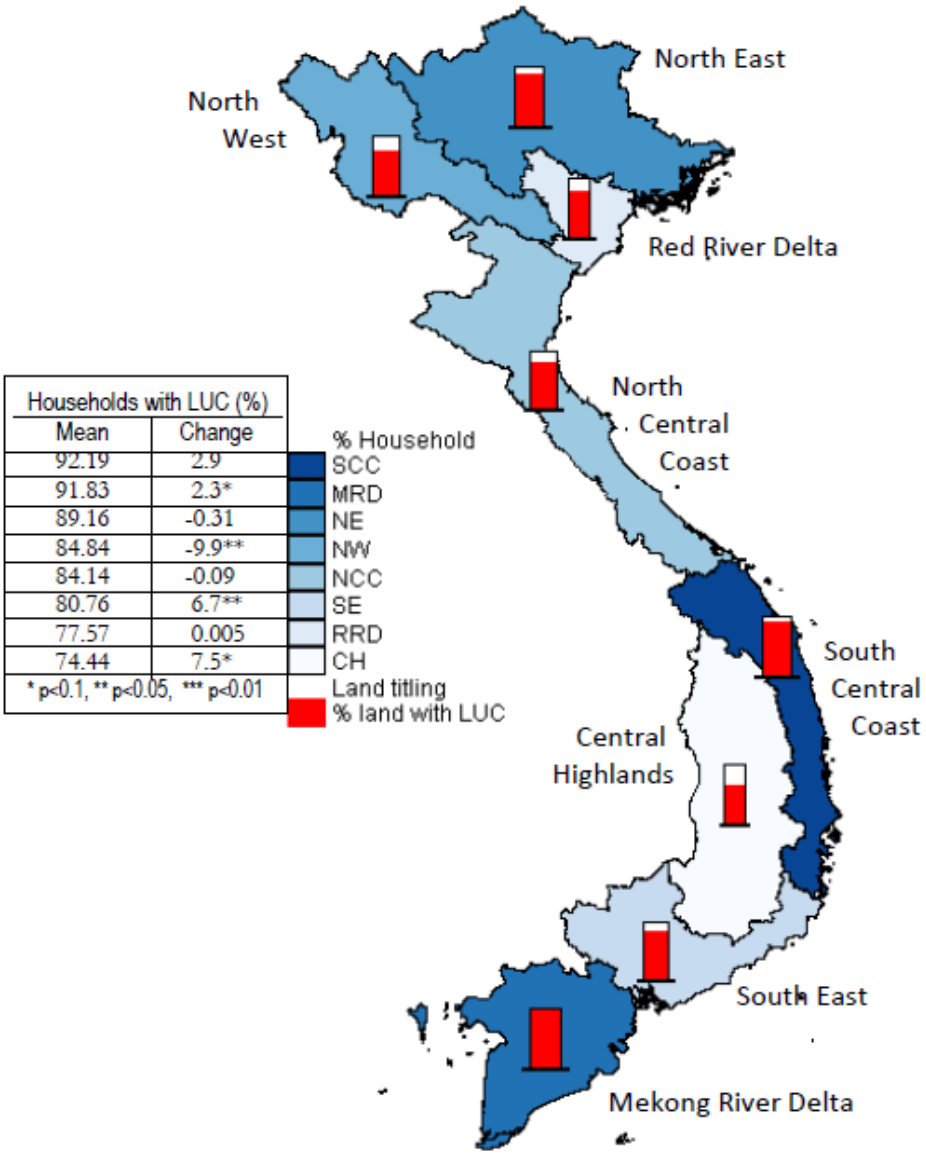


**Figure 6.2 Certified cropland and share of certified cropland by region in Vietnam, 2004 and 2008**

Source: Computed from the pooled sample of VHLSS04 and VHLSS08 for rural households with cropland. The map was created using Stata SE 11.2 with shapefile from GADM database.

Note: Sample weights are used to compute population statistics.
The sequential colour scheme of the base map represents the sequential shares of households with land use certificates (LUC) in eight regions of Vietnam, with the darkest colour representing the greatest values and the lightest colour representing the lowest values. The red rectangles represent the shares of titled land area in total land endowment and are drawn with size proportional to the magnitude of the shares. The rectangles with the black border represent 100% and are drawn with breadth proportional to the share of households with LUC.

for secure tenure; and hence necessary for well-functioning cropland markets and significant investment in land (Barrows and Roth, 1990; Feder *et al.*, 1988; Kille and Lyne, 1993). However, the results of rural land titling programmes have been mixed. For instance, land certification contributed to higher levels of cropland rental market participation, especially by female headed households in Ethiopia (Holden *et al.*, 2011). In contrast, titling programmes did not promote the cropland rental market in Kenya (Place and Migot-Adholla, 1998). In this regard, whether or not the registration of land use certificates has promoted the cropland rental market in rural Vietnam remains an empirical question as titling programmes and their outcomes tend to be context specific. The variable ENDOWTITLED, defined as the share of endowed cropland registered with land use certificates, is included in the model to capture the effect of titling on transaction costs and participation in the cropland rental market.

Despite the changes in Vietnam's land laws to facilitate a free market in land use rights, local authorities still retain some control over land allocation and use (Kerkvliet, 2006; Sikor, 2004; Ravallion and van de Walle, 2008). For example, local authorities often prevent farmers from converting rice land to other crops or even from choosing their own crops (Markussen *et al.*, 2011, Vasavakul, 2006). There have been numerous protests by farmers and claims of misconduct on the part of local officials in charge of land matters (Vasavakul, 2006; Ravallion and van de Walle, 2008). Clearly, use rights to cropland are either curtailed or not assured. This is expected to raise the *ex ante* transaction costs of establishing the landlord's rights and the *ex post* transaction costs associated with a breach of contract. The rice zoning index, RICEZONING, measured as the ratio of rice sown area to total sown area is included in the model to capture transaction costs incurred by market participants due to the limited breadth and assurance of land rights.

Risks stemming from the inadequate assurance of land rights can be especially severe in an economy that is liberalising because the required market-supporting institutions are still being built (McMillan and Woodruff, 1999). In Vietnam there is confusion and uncertainty about legal institutions to enforce land contracts (Dao, 2005). While the Civil Code governs civil contracts and the Ordinance on Economic Contracts governs economic

contracts, it is not always easy to determine the difference between a 'civil' and an 'economic' contract. When a contractual dispute occurs, the parties may spend a significant amount of time disputing these issues alone, and since the law is unclear, judges are often in no better position to determine whether disputes are 'civil' or 'economic' (Dao, 2005). In addition, concerns about complex and costly procedures to defend contracts, unpredictable judgements and possible damage of reputation are also quoted as reasons for not using the legal system to enforce contracts (McMillan and Woodruff, 1999). Instead, farmers tend to rely on private enforcement mechanisms to resolve their disputes (Dao, 2005). In summary, inadequate assurance of land rights owing to weak contract enforcement and dispute resolution introduces risk as a source of transaction costs. The dummy variable, LANDDISPUTE, scoring one for communes with land conflicts and disputes, and zero otherwise, is included in the model to capture both risks at the commune level, which arise from the inadequate assurance of land rights, and inadequate breadth of land rights. Like zoning, LANDDISPUTE is expected to impact negatively on market participation.

*Ex ante* transaction costs, especially search costs, tend to rise when the physical infrastructure, such as roads and telecommunications, is inadequate (Lyne, 2009); when time wasting bureaucratic approvals are required; or when rental contracts attract costly legal fees of notary and registration (de Janvry *et al.*, 2001). In addition, as cropland is immovable (in the sense that there is no physical market place for land transactions) and of variable quality, fixed transaction costs arising from the search for suitable plots can be pronounced. Consequently, information and transport systems play a central role in reducing the costs. In this study, ownership of a telephone, OWNPHONE, and a motorised vehicle, OWNVEHICLE, are used as proxy variables for fixed transaction costs associated with market participation. Households that own these assets are expected to face lower transaction costs when participating in the cropland rental market. Commune specific proxy variables for fixed transaction costs are also included in the model, reflecting access to physical infrastructure. Transaction costs are expected to be lower, and rental market participation higher, in communes that have radio broadcast systems (RADIOSTATION) to disseminate local news and information, roads with permanent

surfaces that can be negotiated by cars (CMNROAD) and a local market serving as a forum for the exchange of information and social interaction (CMNMARKET).

Ethnicity, religion and social norms can also influence transaction costs in the cropland rental market. There are 54 ethnic groups and seven main religious groups in Vietnam (VHLSS Manual, 2008). The dummy variable ETHNICITY - scoring one if the commune has more than one ethnic group, and zero otherwise - accounts for language barriers and lower mutual trust that may serve to raise transaction costs. Similarly, the dummy variable RELIGION - scoring one if the commune has more than one religious group, and zero otherwise - is introduced to capture diversity in belief and norms that could discourage people from exchanging information.

## 6.2 Econometric Evidence and Discussions

### 6.2.1 Model Diagnostics

The model proposed by equations (6.5), (6.6a) and (6.6b) was estimated using the maximum likelihood method with Stata11.2SE software. Initially, a global test of the parallel-lines assumption was conducted using both Brant and Likelihood Ratio tests. The test results rejected the standard ordered logit model and favoured the generalised ordered logit model at the one per cent level of probability. Multi-collinearity diagnostics for the stability of the model were also analysed. As a rule of thumb, a variable that has a variance inflation factor (VIF) greater than ten may merit further investigation (Belsley *et al.*, 2004). All of the variables used to estimate the model had VIFs less than ten. This suggests that the estimated model is free of any serious multi-collinearity. The results of Brant, Likelihood Ratio and multi-collinearity tests are presented in Appendix D. In short, the estimated generalised ordered logit model appears to account adequately for the sources of variation in transaction costs affecting the threshold equations.

### 6.2.2 Determinants of Market Regime for Households in Rural Vietnam

Table 6.3 reports the first part of the estimated model that addresses the question of rental market participation. Recall that the coding of market regimes is in ascending order, i.e. 1 for the lessor regime, 2 for the autarkic regime, and 3 for the lessee regime, where these scores are tied to the latent value of the marginal product of cropland. A positive coefficient estimated for an explanatory variable therefore indicates that increases in the explanatory variable implicitly lead to higher marginal product of cropland. This, in turn, makes it more likely that the household would shift to a higher category of market regimes than its current one, given the prevailing market rental and associated transaction costs, when using the market (see Figure 6.1). By contrast, negative coefficients indicate that higher values of the explanatory variable increase the likelihood of being in the current or a lower market regime. Given this interpretation of the estimated coefficients, overall, the estimated results are consistent with *a priori* expectations.

The estimated model provides strong evidence of factor price equalisation effects. Among the traditional factors of agricultural production, the estimated coefficient of cropland endowment, ENDOWAREA, is negative, while the estimated coefficients of family labour, HHLDSIZE, and farm capital, FARMASSET, are positive. All of these estimated coefficients are statistically significant at the one per cent level of probability. The implication is that the rental market transfers cropland from relatively land-abundant but labour- and capital-poor rural households to those with relatively less cropland endowment but more family labour and farm assets. This is in line with findings in KwaZulu (Crookes and Lyne, 2003; Lyne, 2009), China (Jin and Deininger, 2009) and Ethiopia (Holden *et al.*, 2011). This evidence supports the view that the cropland rental market promotes efficient land use and reduces imbalances in factor endowments at household level, leading to greater equalisation of the shadow prices for cropland, family labour and farm capital across rural households.

Specialisation effects are also evident. It is interesting to observe that the estimated coefficient of the household head's age (HEADAGE) is negative and statistically significant, while the estimated coefficients of the household's education (HHLDEDU),

**Table 6.3 Motives for market participation and outcomes of the cropland rental market**

| Variables | Descriptions | Estimates |
|---|---|---|
| ENDOWAREA | Cropland endowment (ha) | -0.13*** |
| ENDOWPLOT | No. of endowed cropland plots | -0.15*** |
| DELTA | Delta commune (dummy) | -0.22* |
| MIDLAND | Midland commune (dummy) | -0.21 |
| MOUNTAIN | Mountainous commune (dummy) | -0.18 |
| HHLDSIZE | Adult equivalent household size | 0.093*** |
| CHILDDEPCY | Child dependency ratio | 0.84*** |
| WIDOW | Widow headed household (dummy) | -0.067 |
| HEADAGE | Age of the head (years) | -0.042*** |
| lnHEADAGE2 | Ln Square of head age | 0.24 |
| HHLDEDU | Education of the household (yrs) | 0.026** |
| EXPERIENCE | Farming experience of the household (yrs) | 0.018*** |
| SELFFARM | Self-employed farmer (dummy) | 0.30*** |
| EXTENSION | Visits by agri. extension agents to commune | -0.0054** |
| FARMWAGE | Commune average farm wage (1000VND/hr) | 0.091*** |
| lnFARMASSET | Ln Value of farm assets (1000VND) | 0.086*** |
| lnREMITTANCE | Ln Income from remittances (1000VND) | -0.015 |
| lnLOANVALUE | Ln Total loan amount (1000VND) | 0.020*** |
| REGIONCPI | Regional CPI (Rural Red River Delta =1) | -1.37 |
| REGION2 | North East (dummy) | 0.18 |
| REGION3 | North West (dummy) | -0.17 |
| REGION4 | North Central Coast (dummy) | 0.20** |
| REGION5 | South Central Coast (dummy) | 0.17 |
| REGION6 | Central Highlands (dummy) | 0.47** |
| REGION7 | South East (dummy) | 0.46** |
| REGION8 | Mekong River Delta (dummy) | 0.35*** |
| YEAR | Time dummy (1 if 2008, 0 otherwise) | -0.17* |
| OBS | Observations | 11,430 |
| LL | Log likelihood | -5653.65 |
| | Wald chi2(47) | 1547.77 |
| | Prob> chi2 | 0.000 |

Source: Computed from VHLSS04 and VHLSS08.

Note: Ln is the natural logarithm.
*, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively.

farming experience (EXPERIENCE), commitment to farming (SELFFARM) and access to cash (LOANVALUE) are positive and statistically significant. These estimates suggest that the rental market transfers cropland to younger, full-time farmers and households that have more farming experience, better education and greater access to credit. In short, the market transfers cropland to more effective farmers, i.e. to those who are more willing and able to farm. This conclusion is also supported by the positive and statistically significant coefficient estimated for commune average farm wage, FARMWAGE. If differences in farm wages between communes reflect differences in the quality of farm labour, this finding supports the view that farmers in communes with higher quality labour are more likely to hire additional cropland. Alternatively, it could indicate that wages are higher because renting increases profits and the demand for farm labour. The coefficient estimated for EXTENSION is statistically significant but its sign, contrary to expectations, is negative suggesting that extension services are targeted at communes where the marginal productivity of land is relatively low.

Equity impacts of the cropland rental market are also evident. For instance, the negative coefficient estimated for ENDOWAREA suggests that rental transactions tend to equalise farm sizes, with cropland transferred from land-rich to land-poor households (see also Table 4.5). Interestingly, the negative coefficient of the household head's age, HEADAGE, seems to support the hypothesis that the rental market allows young prospective farmers to 'scale the agricultural ladder'. Similarly, the results show that households with more dependent children (CHILDDEPCY) rent in extra cropland – presumably to help meet their higher subsistence needs. On the other hand, the negative coefficient estimated for WIDOW supports the argument that the rental market allows widows, who have few means of generating farm income, to earn rental income or a crop share by renting out their land. Likewise, the negative impact of REMITTANCE (income from remittances) emphasises that the market provides lessors with opportunities to earn rental income while gaining experience in non-farm occupations.

### 6.2.3 Impact of Transaction Costs on Vietnam's Cropland Rental Market

Table 6.4 reports the estimation of the threshold equations containing transaction cost indicators associated with rental market participation. Recall that the threshold equations (6.6a) and (6.6b) are negatively incorporated into equation (6.5). Consequently, a coefficient estimated with a negative sign implies that an increase in transaction costs raises the thresholds for both renting out and renting in, thereby increasing the probability of being a lessor and reducing the probability of being a lessee. In contrast, a positive sign implies that an increase in transaction costs lowers both thresholds, reducing the probability of being a lessor and increasing the probability of being a lessee (see also Figure 6.1).

The estimated regression coefficients presented in Table 6.4 suggest that the transaction cost indicators used in this study are significant determinants of rental market participation and that their impact on participation is consistent with *a priori* expectations. Regarding the renting out threshold equation, the estimated coefficient of ENDOWTITLED, defined as the share of endowed cropland registered with a land use right certificate, is negative and statistically significant at the one per cent level of probability. This suggests that the titling policy has reduced the *ex ante* transaction costs of establishing the landlord's rights and the *ex post* transaction costs associated with fear of losing land that is rented out, encouraging more prospective lessors to participate in the market. The non-significance of land disputes (LANDDISPUTES) suggests that the registration of land use rights has indeed served to promote tenure security in rural Vietnam. In contrast, the positive and statistically significant coefficient estimated for RICEZONING suggests that restrictions on land use lead to use rights being either curtailed or not assured that diminish the opportunity cost of withholding land from the market and so discourage prospective lessors from renting land out.

Turning to the renting in threshold, the estimated coefficient of ENDOWTITLED is negative and statistically significant at the one per cent level of probability. This suggests that households with more secure tenure are less likely to rent additional land in. A

**Table 6.4 Impact of transaction costs on market participation**

| Variables | Descriptions | Threshold equations | |
|---|---|---|---|
| | | Renting out | Renting in |
| ENDOWTITLED | Share of endowed cropland area with LUC (%) | -0.0032*** | -0.0058*** |
| RICEZONING | Rice zoning index | 2.14*** | 0.71*** |
| LANDDISPUTE | Commune has land conflicts and disputes (dummy) | 0.027 | -0.14* |
| OWNPHONE | Household owns a telephone (dummy) | -0.51*** | 0.0095 |
| RADIOSTATION | Commune has a radio relay station (dummy) | -0.50*** | -0.031 |
| OWNVEHICLE | Household owns a motorised vehicle (dummy) | 0.071 | -0.16** |
| CMNROAD | Commune has all-weather roads (dummy) | -0.21** | 0.17** |
| CMNMARKET | Commune has a local market (dummy) | -0.079 | 0.085 |
| ETHNICITY | Commune has diverse ethnic groups (dummy) | 0.80*** | -0.56*** |
| RELIGION | Commune has diverse religions (dummy) | -0.15 | 0.080 |
| OBS | Observations | 11,430 | |
| LL | Log likelihood | -5653.65 | |
| | Wald chi2(47) | 1547.77 | |
| | Prob> chi2 | 0.000 | |

Source: Computed from VHLSS04 and VHLSS08.

Note: *, **, ***: significantly different from zero at the 10%, 5% and 1%level of probability, respectively.

possible explanation is that the improvement in land tenure security encourages households, at least as a first step, to invest in fixed improvements and land-saving technology instead of temporarily renting in more cropland, as suggested by the conceptual framework (Figure 3.1). In contrast, the positive and statistically significant coefficient for RICEZONING suggests that households with a high proportion of their wetland zoned only for rice production are more likely to rent in additional land that can be cultivated to other crops. However, risks stemming from difficulties perceived in enforcing rental contracts and inadequate breadth of land rights (LANDDISPUTE) discourage participation by prospective lessees.

The statistically significant but opposing signs of coefficients estimated for ethnic diversity (ETHNICITY) and all-weather roads in the commune (CMNROAD) support the view that language barriers (lower mutual trust) and poor roads raise transaction costs and

discourage participation on both sides of the rental market. Access to telephones (OWNPHONE) and a local radio station (RADIOSTATION) appear to encourage participation by prospective lessors. Contrary to expectations, owning a motorised vehicle (OWNVEHICLE) reduces rental market participation by lessees, possibly because it also reduces transaction costs in the non-farm job market and discourages farming.

### 6.2.4 Average Marginal Effects

As a supplementary exercise, the marginal effects of the explanatory variables were computed to estimate their statistical and economic significance in each market regime. Although they are relatively intuitive, some issues with the computation of marginal effects for non-linear models are worth discussing. In non-linear models, the value of the marginal effect depends on the specific values of all of the independent variables in the model. Quite often, marginal effects are evaluated at the sample means of the data. However, the use of means when computing marginal effects is criticised for being unrealistic or nonsensical (Bartus, 2005; Greene and Hensher, 2009). For example, the sample means might refer to non-existent observations – as in the case of dummy variables among the explanatory variables. Furthermore, the effects are calculated only at one set of values, i.e. the mean, ignoring all other values.

Current practice is in favour of computing average marginal effects, when it is possible to do so (Greene and Hensher, 2009). With the average marginal effect, a marginal effect is computed for each observation, and then all of the computed effects are averaged (Bartus, 2005). Table 6.5 presents the results for all but the control variables. Following the standard interpretation of linear statistical models, an average marginal effect of a continuous explanatory variable is the change in the expected probability of selecting a particular market regime as that variable increases by one unit, *ceteris paribus*. For dummy variables, the average marginal effects are the differences in the probabilities given a change in the level of the dummy variable.

**Table 6.5 Estimates of average marginal effects[a]**

| Variables | Descriptions | Lessor regime | Lessee regime |
|---|---|---|---|
| **Motives for market participation** | | | |
| ENDOWAREA | Cropland endowment (ha) | 0.0075*** | -0.011*** |
| ENDOWPLOT | No. of endowed cropland plots | 0.0083*** | -0.012*** |
| HHLDSIZE | Adult equivalent household size | -0.0052*** | 0.0077*** |
| CHILDDEPCY | Child dependency ratio | -0.047*** | 0.070*** |
| WIDOW | Widow headed household (dummy) | 0.0038 | -0.0055 |
| HEADAGE | Age of the head (years) | 0.0023*** | -0.0035*** |
| HHLDEDU | Education of the household (yrs) | -0.0014** | 0.0021** |
| EXPERIENCE | Farming experience of the household (yrs) | -0.00098*** | 0.0015*** |
| SELFFARM | Self-employed farmer (dummy) | -0.017*** | 0.025*** |
| EXTENSION | Visits by agri. extension agents to commune | 0.00030** | -0.00045** |
| FARMWAGE | Commune average farm wage (1000VND/hr) | -0.0051*** | 0.0076*** |
| lnFARMASSET | LnValue of farm assets (1000VND) | -0.0048*** | 0.0072*** |
| lnLOANVALUE | LnTotal loan amount (1000VND) | -0.0011*** | 0.0016*** |
| **Impact of transaction costs** | | | |
| ENDOWTITLED | Share of endowed cropland area with LUC (%) | 0.00018*** | -0.00048*** |
| RICEZONING | Rice zoning index | -0.12*** | 0.059*** |
| LANDDISPUTE | Commune has land conflicts and disputes (dummy) | -0.0015 | -0.011** |
| OWNPHONE | Household owns a telephone (dummy) | 0.030*** | 0.00079 |
| RADIOSTATION | Commune has a radio relay station (dummy) | 0.025*** | -0.0026 |
| OWNVEHECLE | Household owns a motorised vehicle (dummy) | -0.0040 | -0.014** |
| CMNROAD | Commune has all-weather roads (dummy) | 0.012** | 0.014** |
| CMNMARKET | Commune has a local market (dummy) | 0.0044 | 0.0070 |
| ETHNICITY | Commune has diverse ethnic groups (dummy) | -0.046*** | -0.047*** |
| RELIGION | Commune has diverse religions (dummy) | 0.0084 | 0.0066 |
| | Observations | 11,430 | |

Source: Computed from VHLSS04 and VHLSS08.

Note: [a] See Appendix D for all estimates, including control variables.
*, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively.

As can be seen from Table 6.5, the absolute marginal effects estimated for family labour and farm assets are smaller for the lessor than for the lessee. This implies that the contribution of these factors to the marginal product of land is lower for the lessor in comparison to the lessee. Hence, rental transactions not only improve efficiency of land

use by raising the marginal product of cropland but also correct imbalances in factor proportions at the farm level. This reinforces the previous finding of factor price equalisation effects. Applying similar logic, the small absolute values of marginal effects estimated for farming experience, self-employed in farming, average household education and available credit (i.e. loans) on the supply side relative to the demand side point to specialisation effects.

Turning to the transaction cost equations in the lower part of the Table 6.5, the statistical significance of marginal effects again highlights the significance of transaction costs associated with participation in the cropland rental market. Furthermore, the results also suggest evidence of the asymmetry in transaction costs across the two sides of the market. For example, the estimated marginal effect of the rice zoning index (RICEZONING) for the lessor regime (-0.12) is negative and statistically significant at the one per cent level of probability. This estimate suggests that restrictions on land use reduce the expected probability of being a lessor by 12 percentage points, *ceteris paribus*. For the lessee regime, the estimated marginal effect of the rice zoning index is approximately 0.06. The estimate is positive and statistically significant at the one per cent level of probability, suggesting that restrictions on land use increase the expected probability of renting in additional land by six percentage points, keeping other factors equal.

However, the asymmetry in transaction costs is not clear in some sources. For example, the estimated marginal effects of the dummy variable CMNROAD (i.e., communes with all-weather roads) are 0.012 and 0.014 for the lessor and lessee regimes respectively. They are both positive and statistically significant at the five per cent level of probability. This suggests that improvements in all-weather roads in the commune reduce transaction costs and encourage participation on both sides of the rental market. The expected probability of being a lessor increases by 1.2 percentage points and that of being a lessee increases by 1.4 percentage points, *ceteris paribus*. This appears to suggest the absence of asymmetry as the difference between the estimates is small. Fortunately, the estimated model allows for formal tests of the presence of asymmetric transaction costs. The next section elaborates on this issue.

### 6.2.5 Tests for the Significance and Asymmetry of Transaction Costs

If there existed a frictionless market, then the price band created by transaction costs should be trivial and the rent paid by lessees and the rent received by lessors should be the same. A non-trivial price band exists in the land rental market if and only if $r(TRC^i) - r(TRC^o) > 0$. As pointed out in equation (6.3), it is not possible to identify the constant term of the threshold equations and the constant term underlying the latent value of the marginal product of land. Given the problem of identification, a test for the significance of transaction costs (other than a constant term) can be conducted by restricting parameters on the variables of transaction costs in the threshold equations to zero, i.e. $H_0 : \gamma^o = 0$ and $\gamma^i = 0$. Similarly, tests for the significance of transaction costs incurred on each side of the market can be conducted by restricting parameters on the variables of transaction costs in the renting in and renting out threshold equations to zero, i.e. $H_0 : \gamma^o = 0$ and $H_0 : \gamma^i = 0$.

If market failure was not a selective phenomenon (in the sense that transaction costs faced by lessors and lessees are symmetric and do not significantly depend on participant status), the price band should be symmetric across households on each side of the market. Hence, a test for the asymmetry in transaction costs can be conducted by equalising parameters on the variables of transaction costs in the threshold equations, i.e. $H_0 : -\gamma^o = \gamma^i$. If the symmetry of the price band (i.e. transaction costs are not selective, lessors and lessees face the same transaction costs) is rejected, the reasons behind market failure can then be further identified by testing for asymmetry in the individual proxy variables for transaction costs. The alternative hypothesis in all of the preceding tests is that the parameters are unrestricted.

Table 6.6 lists the null hypotheses under four tests and reports the results of Wald tests for a frictionless cropland rental market and for symmetry in transaction costs (other than a constant term) on both sides of the market. The null hypothesis is rejected for all tests at the one per cent level of probability. Hence, it is concluded that there is strong sample evidence of the significance and asymmetry of transaction costs on each side of the cropland rental market in rural Vietnam.

**Table 6.6 Wald tests for a frictionless rental market and symmetries in transaction costs**

| Tests[a] | W[b] | k | P-value |
|---|---|---|---|
| - No transaction costs (other than a constant term) | | | |
| $H_0 : \gamma^o = 0$ and $\gamma^i = 0$ | 649.5 | 20 | 0.000 |
| - No renting out transaction costs (other than a constant term) | | | |
| $H_0 : \gamma^o = 0$ | 445.9 | 10 | 0.000 |
| - No renting in transaction costs (other than a constant term) | | | |
| $H_0 : \gamma^i = 0$ | 180.7 | 10 | 0.000 |
| - No asymmetries in transaction costs (other than a constant term) | | | |
| $H_0 : -\gamma^o = \gamma^i$ | 359.2 | 10 | 0.000 |

Source: Computed from VHLSS04 and VHLSS08.

Note: [a] $\gamma^o$ and $\gamma^i$ are vectors of parameters associated with transaction costs (TRCs) in the renting in and renting out threshold equations defined as in equations (6.6a) and (6.6b).

[b] W is the Wald statistic, $k$ = number of restrictions; P-value is defined as $1 - \text{Prob}(\chi^2(W,k) > 0)$. Likelihood ratio tests were also conducted and gave the same results.

Despite this evidence of asymmetry in transaction costs incurred by lessees and lessors, it is still not clear that asymmetry exists in each of the individual sources of transaction costs. For example, the presence of all-weather roads (CMNROAD) and ethnic diversity (ETHNICITY) appear to create significant transaction costs that are similar for both lessees and lessors. Tests for asymmetry in transaction costs derived from these individual sources can be conducted by equalising individual parameters in the threshold equations, i.e. $H_0 : -\gamma_k^o = \gamma_k^i$. The null hypotheses are that there is symmetry in each source of transaction costs while the alternative hypothesis in every test is that the parameters are not equal. Table 6.7 presents the results of Wald tests conducted for asymmetry in the coefficients estimated for CMNROAD and ETHNICITY. These variables generate statistically significant impacts on market participation that may only appear to be of similar size for lessors and for lessees.

**Table 6.7 Wald tests for individual sources of asymmetry in transaction costs**

| Variables | Sources of asymmetry | Threshold equations | | W[1] | P-value |
|---|---|---|---|---|---|
| | | Renting out | Renting in | | |
| CMNROAD | Commune has all-weather roads | -0.21** | 0.17** | 0.12 | 0.731 |
| ETHNICITY | Commune has diverse ethnic groups | 0.80*** | -0.56*** | 2.79 | 0.095 |

Source: Computed from VHLSS04 and VHLSS08.

Note: [1] W is the Wald statistic.
P-value is defined as $1 - \text{Prob}(\chi^2(1, W) > 0)$.

The test results reported in Table 6.7 highlight the importance of testing for asymmetry. Whereas the test finds no evidence of asymmetry for the variable CMNROAD, it does detect a significant difference (at the 10% level of probability) in the impact that ETHNICITY has on lessors and lessees. The existence (or absence) of significant asymmetries could have important implications for policy.

### 6.2.6 The relative importance of significant sources of transaction costs

As a supplementary exercise, the standardised coefficients of the transaction cost indicators in the threshold equations were computed to rank the relative importance of significant sources of transaction costs associated with participation in the cropland rental market. One of the reasons for the use of standardised coefficients is that the transaction cost indicators are measured in different units with most of them having no natural metric. Standardised coefficients transform all these variables into a common metric (i.e. standard deviation units). In this regard, standardised coefficients are useful for comparing the relative strength of influence of different explanatory variables on the dependent variable in the sample (Long and Freese, 2001; Menard, 2011).

However, the computation of standardised coefficients in logistic regression raises some issues that are not problematic in ordinary least square regression (for a detailed discussion, see Menard, 2011). For example, if Y is the dependent variable, in logistic regression the actual dependent variable is not Y, but logit(Y) with logit(0) = - $\infty$ and

logit(1) = + ∞. These transformations do not permit the computation of means or standard deviations. To resolve this problem, Menard (2011) and Long and Freese (2001) suggest (a) ignoring the variance in logit(Y) and standardising the estimated coefficients ($\hat{\beta}$) based on their standard deviations ($\sigma$), giving partially standardised coefficients $\hat{\beta}^* = \hat{\beta} \cdot \sigma$; (b) making up a number for the variance in logit(Y); and (c) estimating the variance in logit(Y). For the purpose of this study, the first solution was adopted as the partially standardised coefficients "do provide the rank ordering of the strengths of the relationships of the predictors to the outcome, but cannot otherwise be interpreted or used in the same way as standardised coefficients in multiple regression" (Menard, 2011, p.1416). Table 6.8 reports the partially standardised coefficients estimated for each of the transaction cost proxy variables in the threshold equations.

Overall, Table 6.8 points to the difference in the effect of individual sources of transaction costs between the lessor and the lessee, highlighting the asymmetries in transaction costs faced by market participants. On the supply side of the rental market, the rice zoning index (RICEZONING) appears to be the most important source of transaction costs that discourage prospective lessors from supplying cropland to the market. Transaction costs stemming from ethnic diversity (ETHNICITY) come second in the rank ordering and also have a negative effect on market participation. In contrast, improvements in physical infrastructure reduce transaction costs and encourage participation by prospective lessors. However, as suggested by the rank ordering, the influence of physical infrastructure on market participation is weaker than the influence of restrictions on land use and of ethnic diversity in the commune. In particular, sources of transaction costs stemming from access to telephones (OWNPHONE), the presence of a local radio station (RADIOSTATION) and all-weather roads in the commune (CMNROAD) are ranked third, fourth and sixth respectively. Registration of land use right certificates (ENDOWTITLED), which also encourages participation by prospective lessors, is the fifth most important of the significant sources of transaction costs affecting the supply side of the land rental market.

Turning to the demand side of the market, ethnic diversity (ETHNICITY) has the highest rank ordering but impacts negatively on prospective lessees. Sources of transaction costs

**Table 6.8 The relative importance of sources of transaction costs**

| Variables | Descriptions | Renting-out threshold | | | Renting-in threshold | | |
|---|---|---|---|---|---|---|---|
| | | Threshold coefficients | Partially standardised coefficients | Rank ordering in magnitude | Threshold coefficients | Partially standardised coefficients | Rank ordering in magnitude |
| ***Land tenure security*** | | | | | | | |
| ENDOWTITLED | Share of endowed cropland with LUC (%) | -0.0032*** | -0.125 | 5 | -0.0058*** | -0.223 | 3 |
| RICEZONING | Zoning index for rice land | 2.14*** | 0.801 | 1 | 0.71*** | 0.267 | 2 |
| LANDDISPUTE | Commune with land conflicts and disputes | 0.027 | 0.013 | 10 | -0.14* | -0.066 | 6 |
| ***Other sources of transaction costs*** | | | | | | | |
| OWNPHONE | Household owns a telephone | -0.51*** | -0.237 | 3 | 0.0095 | 0.004 | 10 |
| RADIOSTATION | Commune has a radio relay station | -0.50*** | -0.231 | 4 | -0.031 | -0.013 | 9 |
| OWNVEHICLE | Household owns a motor vehicle | 0.071 | 0.035 | 9 | -0.16** | -0.080 | 5 |
| CMNROAD | Commune has all-weather roads | -0.21** | -0.103 | 6 | 0.17** | 0.083 | 4 |
| CMNMARKET | Commune has a local market | -0.079 | -0.039 | 8 | 0.085 | 0.041 | 7 |
| ETHNICITY | Commune has diverse ethnic groups | 0.80*** | 0.299 | 2 | -0.56*** | -0.278 | 1 |
| RELIGION | Commune has diverse religions | -0.15 | -0.073 | 7 | 0.080 | 0.040 | 8 |

Source: Computed from VHLSS04 and VHLSS08.

stemming from land tenure insecurity also appear to be relatively important. The rice zoning index (RICEZONING) ranks second followed by the registration of land use right certificates (ENDOWTITLED). Whereas zoning encourages prospective lessees to participate in the market, registration of land use rights discourages their participation. The presence of all-weather roads in the commune (CMNROAD) and vehicle ownership (OWNVEHICLE) represent the fourth and fifth most important of the significant sources of transaction costs affecting the demand side of the rental market. Whereas good quality roads encourage prospective lessees to participate in the land rental market, ownership of a motorised vehicle has the opposite effect, presumably because it encourages farmers to participate in the off-farm job market.

In summary the findings indicate that the most important sources of transaction costs faced by market participants stem mainly from insecure tenure (ENDOWTITLED and RICEZONING), ethnic diversity (ETHNICITY), and physical infrastructure (OWNPHONE, RADIOSTATION and CMNROAD). The suggestion that risk arising from tenure insecurity is a key determinant of rental market efficiency and affects lessors and lessees differently is consistent with Thomson and Lyne's (1991) finding in KwaZulu that the lessor often bears higher transaction costs owing to the risk of permanently losing land rights in a situation where land is central to a household's social security.

## 6.3 Chapter Summary

Correcting imbalances in factor proportions at the farm level, growing farm enterprises and adopting new farming technology to raise farm income motivate rural households to participate in cropland rental markets (Binswanger *et al.*, 1995; Sadoulet *et al.*, 2001; Teklu and Lemi, 2004). Hence development of the market has important implications for agricultural growth and development. However, to a large extent, transaction costs associated with market participation prevent rural households from doing so (Lyne and Thomson, 1998). This chapter set out to investigate the efficiency and equity impacts of the cropland rental market in rural Vietnam, and to identify the determinants of transaction costs in order to understand their existence and significance. To achieve these goals, a generalised ordered logit model with shifting thresholds accounting for effects of

transaction costs associated with market participation was specified and estimated, using the pooled data from the VHLSS04 and VHLSS08 for the sub-sample of rural households that farm or have farmland.

Overall, the findings show that the cropland rental market reduced imbalances in factor endowments at household level, leading to greater equalisation of the shadow prices for cropland, family labour and farm capital inputs across farming households. The estimated model also pointed toward specialisation effects. The rental market leads to comparative advantage gains by transferring cropland to more effective users (i.e. those more willing and able to farm), allowing them to specialise in agricultural production.

Equity advantages were also revealed. The market tends to equalise farm sizes, with cropland transferred from land-rich to land-poor households, allowing young prospective farmers to 'scale the agricultural ladder' and households with more dependants to rent in extra cropland to help meet their subsistence needs. The rental market allowed widow-headed households, which often have few means of generating farm income, to earn income or a crop share by renting out their land. For those households seeking jobs outside the farming sector, the market provided them with opportunities to gain experience in non-farm occupations while still earning rental income.

However, the results presented in this chapter highlight significant transaction costs constraining the efficiency of Vietnam's rental market for cropland. On a positive note, the evidence suggests that formal registration of land use rights had strengthened tenure security and promoted land use efficiency – both by encouraging prospective lessees to farm their own land more intensively and by reducing transaction costs that discourage prospective lessors from participating in the land rental market. On the other hand, zoning regulations imposed by local government authorities undermine tenure security and reduce land use efficiency. Farmers are obliged to grow rice on wetlands that could otherwise produce more profitable crops. This lowers the opportunity cost of cropland and discourages prospective lessors from participating in the rental market. Ethnic diversity and poor physical infrastructure were also found to play significant and important roles in raising transaction costs and discouraging participation in the land rental market.

The findings further pointed toward asymmetry in transaction costs on the supply and demand sides of the market. Six of the ten variables representing sources of transaction costs clearly impacted differently on lessors and lessees. These included registration of land use rights, zoning of wetlands exclusively for rice production, disputes over land, the presence of a local radio station and ownership of vehicles and telephones. Two variables (religious diversity and the presence of a commune market) had no impact on market participation, and the remaining two variables (ethnic diversity and the presence of all-weather roads) appeared to have very similar impacts on lessors and lessees. A unique feature of the model developed in this study is that it provides a test for asymmetry. Application of this test revealed that, whereas no evidence of asymmetry was found for the presence of all-weather roads, ethnic diversity impacted asymmetrically on lessees and lessors.

Asymmetries in transaction costs have implications for policy. Although the registration of land use rights and application of zoning regulations affect lessors and lessees differently, their impacts on land use efficiency are unambiguous. These variables are important sources of transaction costs and are clearly within the government's locus of control. Ethnic diversity is also an important source of transaction costs, and more so for lessors than for lessees. However, from a policy perspective, there may be little that the government can do in the short-term to address the issues embedded in ethnic diversity - an area that requires more research. Physical infrastructure, although a relatively less important source of transaction costs, certainly does influence market participation – and usually in different ways for lessors and lessees. The key finding in this regard is that the provision of all-weather roads in communes encourages participation equally on both sides of the market, whereas access to telephones and a local radio station promote only the supply side of the market.

The next and final chapter presents the conclusions of this study and elaborates on its policy implications. It also discusses the limitations of the study and suggests opportunities for further research.

# Chapter 7

# Conclusions and Policy Implications

**This chapter**

* summarises the research questions and empirical findings;
* draws conclusions from these empirical findings;
* offers recommendations for policy and practice; and
* discusses limitations encountered in the study and presents suggestions for future research.

## 7.1 Research Questions and Empirical Finding

This thesis sets out to examine the efficiency and equity impacts of the cropland rental market in rural Vietnam, and the efficiency of the market itself. The rental market for cropland is said to be inefficient in many parts of rural Vietnam, preventing farmers from consolidating land parcels, growing their farm enterprises, adopting new technology and increasing both their incomes and those of non-farming rural households. Economic theory suggests that voluntary rental transactions provide an equitable way of improving the efficiency of land use, promoting agricultural productivity and growing rural incomes (see Section 2.4). However, empirical evidence on factors that impede or promote the operation of land rental markets, especially in transition economies like Vietnam where farms are uniformally small, remains limited.

The overarching objective of this research was to examine the efficiency of the rental market for cropland and its role in alleviating poverty in Vietnam. Specific objectives were to (a) gain a better understanding of factors affecting farming household participation in rental markets for cropland in rural Vietnam; (b) empirically explore relationships between farm efficiency, income, equity and rental market transactions in

rural Vietnam; (c) enrich the empirical literature on cropland rental markets in transition countries; and (d) inform land reform policy in Vietnam. In view of the research objectives, this study sought to address the following research questions:

(1) What are the patterns and trends in the cropland rental market in rural Vietnam?
(2) Will a more efficient rental market for cropland help to improve farm efficiency, incomes and equity in rural Vietnam?
(3) What impact do household endowments have on the motive for participating in the cropland rental market in rural Vietnam?
(4) To what extent do transaction costs prevent rural households from participating in the cropland rental market in rural Vietnam?

To address these questions, an analytical framework was introduced to better understand how land policy, tenure security, rental markets and agricultural productivity are related by analysing the linkages between them. A theoretical model was proposed to explain the motives of rural households for participating in the cropland rental market, and their behaviour in the presence of transaction costs. Testable research hypotheses were drawn from this theoretical framework. The empirical analyses used sample data for rural households with cropland drawn from the Vietnam Household Living Standards Surveys in 2004 and 2008.

### 7.1.1 What are the Patterns and Trends in the Cropland Rental Market in Rural Vietnam?

The first research question was addressed in Chapter 4. This chapter presented descriptive analyses of the current situation, and of patterns and trends in rural Vietnam's rental market for cropland. Overall, evidence from these descriptive analyses suggested that the efficiency of the rental market had been improving and that rental transactions were creating an emerging commercial farmer class. The proportion of farm households making use of the rental market increased from 16.9 per cent in 2004 to 18.4 per cent in 2008. The Red River Delta, which is the region with the lowest per adult equivalent cropland endowment, appeared to have the most active rental market with nearly 24 per cent of

sample rural households in this region trading cropland. Only one region, the Central Highlands, experienced a decrease in participation over 2004-2008 period.

On the supply side of the market, the number of lessors increased by 2.5 percentage points over the study period. The share of absentee lessors (i.e. those renting out all of their cropland) increased from about 36.5 per cent in 2004 to 42 per cent in 2008. On the demand side, the share of lessee households remained constant at approximately ten per cent of the sample households. However, lessees still outnumbered lessors, particularly in the northern regions. Also interesting was that the share of landless households using the rental market to access cropland increased from approximately eight per cent in 2004 to nearly 12 per cent in 2008. This does not imply that the number of landless households is rising but does suggest that the land rental market is accessible to the landless poor. A small group (less than 0.5%) of rural households participated in the cropland rental market as both lessors and lessees. These participants may use the rental market primarily to consolidate their farms by renting out distant parcels and renting in plots adjacent, or at least closer, to their farms.

The sample data also showed that the vast majority of participants transacted land for annual (rather than perennial) crops, and that some rental transactions did not involve a direct payment. However, tenants that 'borrow' cropland usually pay the lessors' land taxes, which typically amount to 15-20 per cent of net crop income. Furthermore, the share of lessees with borrowing contracts decreased by 1.4 percentage points while the share of lessors with payment contracts increased by nearly two percentage points over the study period. This suggests that borrowing arrangements are giving way to payment contracts.

Another indicator of cropland rental market activity is the scale of the average transactions. The survey data show that the average area of cropland rented out by lessors is 0.27 ha, while the average amount rented in by lessees is 0.32 ha. The difference between these two estimates is statistically significant. This suggests that lessees are consolidating land by renting in cropland from several different lessors, implying the

emergence of a commercial farmer class. On average, the area operated by farming households was higher in 2008 than it was in 2004 although the difference was not statistically significant. Nevertheless, the data consistently suggest a consolidation of parcels, indicated by a reduction in the average number of plots operated. Reduced land fragmentation in rural Vietnam is expected to improve cost-effectiveness. Regarding transactions of cropland registered with land use certificates, the average area transacted with land use certificates was much higher for lessors (0.23ha) than for lessees (0.12ha). On average, approximately 84 per cent of lessors' rented out cropland was registered with land use certificates whereas the estimate for lessees was closer to 30 per cent over the study period. This suggests a perception that certification reduces the lessor's risk of losing cropland permanently when it is rented out.

Although the evidence points to an overall improvement in the functioning of Vietnam's cropland rental market, more than 80 per cent of the sample households did not participate in the market. This is higher compared to corresponding estimates of 54 per cent for India, 46 per cent for Eritrea and 37 per cent for rural Bangladesh. A possible explanation for non-participation is that high transaction costs effectively drive a wedge between potential lessees and lessors. This may well be the case in Vietnam where it is unlikely that non-participating households have optimal levels of both land and non-land factors. The finding that some four to five per cent of sample households left cropland idle lends support to the view that transaction costs are high - fixed *ex ante* transaction costs in particular owing to very small farm sizes. In addition, cropland rented in accounts for a very small share (approximately 4.3%) of the total cropland accessed by rural households. This is much lower compared to corresponding estimates of 29.9% per cent for rural Bangladesh. The shares of privately purchased cropland were three and two times higher than those of rented-in cropland for 2004 and 2008, respectively. The lesser role played by the rental market could indicate higher levels of risk (i.e. *ex post* transaction costs) associated with rental transactions.

### 7.1.2 Will a More Efficient Rental Market for Cropland Help to Improve Farm Efficiency, Incomes and Equity in Rural Vietnam?

The conceptual framework proposed in this thesis predicts that a more efficient rental market would promote agricultural productivity by encouraging the transfer of cropland from less effective to more effective farming households, and by consolidating land to better exploit economies of scale. Evaluating the efficiency of a rental market (in order to address the second research question) therefore presumes that the most effective farmers are known. The descriptive analysis presented in Chapter 4 supports the hypothesis that the land rental market promotes efficiency in farming. For example, lessees were much younger than lessors and had higher levels of formal education and farming experience. These are sources of human capital. Lessees also had more family labour than lessors, owned more farming equipment and machinery and applied seasonal inputs and family labour more intensively than did lessors.

Differences between the technical efficiency of lessees and lessors shed more light on the efficiency of the cropland rental market. These differences were used to test whether or not rental transactions transferred cropland from less effective to more effective farming households. The results of a stochastic frontier production function analysis reported in Chapter 5 show that the average technical efficiency estimated for lessees exceeded that of lessors by a statistically significant margin of six percentage points. The implication is that the land rental market in rural Vietnam is 'doing the right things' by transferring land to farmers who are 'doing things right'. In addition, the average technical efficiency of sample households was estimated as 0.85, suggesting that reasonable gains in crop production (15%) could still be achieved even with existing technologies.

The results of the technical efficiency model also showed that technical efficiency is significantly higher on cropland that is registered with a land use certificate. This highlights the positive contribution of Vietnam’s land registration programme to rental transactions and long-term investments in farming. However, tenure security derived from land titling policies is diminished by local authorities' control over land use. The results showed that restrictions on land use rights, particularly land for growing rice, dampen

farmers' incentives and reduce technical efficiency. Importantly, it was found that technical efficiency increased as the share of hired land in the total area operated increased. In the context of rural Vietnam where virtually all households have access to cropland, and farm sizes are uniformly small, this finding indicates that farmers who rent in more cropland are more effective land users than other farming households. Hence, promoting the cropland rental market is important for facilitating the allocation of cropland to achieve higher levels of efficiency in land use and agricultural productivity.

A subsequent analysis of factors affecting household participation in the rental market (Chapter 6) provided more explicit evidence of the rental market's contribution to farming efficiency. The results showed that the rental market reduced imbalances in factor endowments at household level, leading to greater equalisation of the shadow prices for cropland, family labour and farm capital inputs across farming households. Perhaps even more important than these static efficiency gains, the cropland rental market is creating a class of emerging commercial farmers who are using the market to consolidate and extend their farming operations to benefit from size economies that make investments in knowledge and new technology more profitable. In this regard, the cropland rental market could go a long way towards overcoming the strict ceiling on land ownership (three hectare in terms of the 2003 Land Law) and helping farm households achieve their optimal operational farm sizes.

Some of the rental market's predicted equity advantages were also apparent. The findings in Chapter 6 highlighted the market's tendency to transfer land from land-rich to land-poor households, enabling young prospective farmers to 'scale the agricultural ladder', and allowing households with more dependants to rent in extra cropland to help meet their subsistence needs. Similarly, the rental market allowed widows, who typically lack the labour and liquidity needed to farm, to earn income or a crop share by renting out their land. For those households seeking jobs outside the farming sector, the market created an opportunity to gain experience in non-farm occupations while still earning rental income.

### 7.1.3 What Impact Do Household Endowments Have on the Motive for Participating in the Cropland Rental Market in Rural Vietnam?

The results of a generalised ordered logit model reported in Chapter 6 showed that a number of socio-economic factors (both land and non-land) significantly affected rural household participation in the cropland rental market. For the same level of non-land factors, households better endowed with cropland and those with more fragmented farms are more likely to supply land to the rental market. In contrast, households that are poor in land relative to non-land factors have a higher propensity to participate on the demand side of the rental market.

The propensity to hire additional cropland is also higher for rural households better endowed with family labour, and those with more dependants, more educated members, more farming experience and a head who specialises in farming and who is relatively young. Widow-headed households, on the other hand, have a higher propensity to supply cropland. Households that own more farm assets and those with access to loans (liquidity) are more likely to rent in cropland. Surprisingly, the number of visits made by agricultural extension agents to the commune had negative effect on the decision to rent in land.

Importantly, estimates of the average marginal effects revealed that the marginal effects were consistently larger for lessees than for lessors. The implication is that rental transactions not only improved the efficiency of land use by raising the marginal product of cropland but also corrected imbalances in factor proportions at the farm level and created gains from specialisation.

### 7.1.4 To What Extent Do Transaction Costs Prevent Rural Households from Participating in the Cropland Rental Market in Rural Vietnam?

This question was addressed by extending the generalised ordered logit model (estimated in Chapter 6) to allow household market participation thresholds to vary with transaction costs. Overall, the results presented pointed to the significance and asymmetry of

transaction costs associated with cropland rental market participation in rural Vietnam. Formal tests for a frictionless rental market and for the insignificance of transaction costs incurred on each side of the market were strongly rejected, providing evidence of market inefficiency.

The findings further pointed toward asymmetry in transaction costs on the supply and demand sides of the market. Some sources of transaction costs clearly impacted differently on lessors and lessees. These sources included zoning of wetlands exclusively for rice production, registration of land use rights, disputes over land, the presence of a local radio station and ownership of vehicles and telephones. Religious diversity and the presence of a commune market had no impact on market participation. Without formal tests for asymmetry, ethnic diversity and the presence of all-weather roads appeared to have similar impacts on lessors and lessees. A unique feature of the model developed in this study is that it provides a test for asymmetry. Application of this test revealed that, whereas no evidence of asymmetry was found for the presence of all-weather roads, ethnic diversity impacted asymmetrically on lessees and lessors.

On the supply side of the rental market, the rice zoning index appears to be the most important source of transaction costs that discourage prospective lessors from supplying cropland to the market. Transaction costs stemming from ethnic diversity come second in the rank ordering and also have a negative effect on market participation. In contrast, improvements in physical infrastructure reduce transaction costs and encourage participation by prospective lessors. However, as suggested by the rank ordering, the influence of physical infrastructure on market participation is weaker than the influence of restrictions on land use and of ethnic diversity in the commune. In particular, sources of transaction costs stemming from access to telephones, the presence of a local radio station and all-weather roads in the commune are ranked third, fourth and sixth respectively. Registration of land use right certificates, which also encourages participation by prospective lessors, is the fifth most important of the significant sources of transaction costs affecting the supply side of the land renal market.

Turning to the demand side of the market, ethnic diversity has the highest rank ordering but impacts negatively on prospective lessees. Sources of transaction costs stemming from land tenure insecurity also appear to be relatively important. The rice zoning index ranks second followed by the registration of land use right certificates. Whereas zoning encourages prospective lessees to participate in the market, registration of land use rights impacts negatively on their participation. Although the registration of land use rights and application of zoning regulations affect lessors and lessees differently, but their impacts on land use efficiency are unambiguous. The presence of all-weather roads in the commune and vehicle ownership represent the fourth and fifth most important of the significant sources of transaction costs affecting the demand side of the rental market. While good quality roads encourage prospective lessees to participate in the land rental market, ownership of a motorised vehicle has the opposite effect, presumably because it encourages farmers to participate in the off-farm job market.

## 7.2 Conclusions and Policy Implications

Development economists and practitioners have long been concerned about efficient and sustainable land use with a view towards identifying policy options that have the potential to make everybody better off. In rural Vietnam, farm sizes are uniformly small. Following the break-up of collective farms in the late 1980s, rural households were allocated cropland for their own use by local government authorities. This state-mandated process still accounted for almost 62 per cent of the household land endowment in 2008. However, this non-market allocation mechanism does not meet continuous demand for land, especially among willing and able farmers whose optimal farm sizes exceed the maximum limits on farmland areas that individuals are permitted to own. As a result farmers are increasingly engaging in private land rental transactions. Economic theory suggests that voluntary rental transactions provide an equitable way of improving the efficiency of land use, promoting agricultural productivity and growing rural incomes. It also recognises that transaction costs are personalised and shaped by individual and household characteristics.

This study uses a generalised ordered logit model to formally test for the significance and asymmetry of transaction costs associated with participation in Vietnam's cropland rental market. As far as the author was aware, no previous studies had attempted to measure and test for asymmetric transaction costs in a land rental market. In the context of Vietnam, this study is also the first to measure responses in cropland markets since the 2003 Land Law was passed. Some key findings and conclusions emerge from this study that carry significant policy implications.

First, it was found that the efficiency of the rental market had improved over the study period and rental transactions were creating an emerging commercial farmer class. The survey data showed a trend of increasing participation in the rental market by rural households to adjust their farm sizes, although the level of market participation and the scale of transactions varied across regions. It was concluded that Vietnam's land reforms over the previous twenty years had done much to strengthen tenure security. It is recommended that the government should step up its efforts to complete the registration programme.

Second, it was confirmed that voluntary rental market transactions had promoted farming efficiency in Vietnam. The results of a stochastic frontier analysis showed that lessees are consolidating and extending their farming operations, and are more technically efficient than lessors. They also showed that crop production could increase by 15 per cent with existing technologies. Third, the study found clear benefits for both lessors and lessees. It was concluded that there was merit in Vietnam's cautious approach to a land sale market and that a more efficient rental market could contribute significantly to crop production.

Fourth, it was found that the rental market, and hence its efficiency and equity benefits, was constrained by high unit transaction costs. The study identified significant sources of transaction costs and ranked their relative impact on lessors and lessees. Importantly, it demonstrated that lessors and lessees are affected similarly by some of these sources and differently by others. Registration of land rights and the application of zoning regulations affect lessors and lessees differently, but their impacts on land use efficiency are

unambiguous. These are important sources of transaction costs and it is recommended that, in addition to completing the land registration programme, the government should consider relaxing restrictions on the use of wetlands to grow crops other than rice. Ethnic diversity is also an important source of transaction costs, and more so for lessors than for lessees. However, from a policy perspective, there may be little that the government can do in the short-term to address the issues embedded in ethnic diversity - an area that requires more research. Physical infrastructure is a significant but relatively less important source of transaction costs. It was found that the provision of all-weather roads in communes encourages participation equally on both sides of the market, whereas access to telephones and a local radio station promote only the supply side of the market. It is recommended that public resources should be allocated to commune roads ahead of telephone services and local radio stations, which are also more likely to attract private investors. While there are policy implications that can be drawn from these empirical findings, there are caveats that are elaborated on in the next section.

## 7.3 Limitations and Future Research

This study attempts to identify and understand the combined impact of tenure security and transaction costs that affect participation in, and hence the efficiency of, the cropland rental market in Vietnam. Its findings, conclusions and policy recommendations are obviously conditional on the data and analytical framework employed. No attempt was made to provide detailed information about sources of tenure insecurity and high transaction costs, or to measure the absolute size of transaction costs associated with market participation. Research on these issues would require much more information.

For the most part of this study, estimates were computed from cross section sample data pooled across the VHLSS04 and VHLSS08 datasets. A decision was taken not to use panel data as this would have resulted in the loss of a large amount of information. With a richer dataset and an appropriate extension of the generalised ordered logit model, future research using panel data could yield useful insights into the dynamic aspects of the cropland rental market.

Neither the VHLSS04 nor the VHLSS08 provided information on land rented out by rural households that did not undertake any farming during the 12 months preceding the survey. Such non-inclusion may introduce a bias to econometric estimates. This is an issue that affects all studies of agricultural land market activity, whether in Vietnam or elsewhere, that follow the standard format of the World Bank Living Standards Measurement Study to examine farmland transactions (Grosh, 2000). Data on input and output prices were also not available for this study, limiting alternative methodologies that utilise dual approaches, such as cost minimisation or profit maximisation, to analyse effects of the cropland rental market on the improvement of farm efficiency. Also, the variable used to represent restrictions on land use rights was not an ideal measure of zoning restrictions. A more rigorous analysis of these zoning restrictions will require more explicit data.

Further, there are some questions left unanswered in this study. For example, how other market imperfections and household level constraints, including social capital and cultural norms (e.g. trust and honesty) affect the volume of rental transactions and the amount of cropland transacted, and how the rental market impacts on fixed improvements to land and the adoption of new technology? These are important topics for future research. So too is the rental market's impact on farmer demand for additional reforms to extend the duration of their land rights and to relax constraints on the area of land that they may own. These demands will test the political appetite for a land sale market.

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# Appendix A

## An Agricultural Household Model with Imperfect Factor Markets

### 1. Household Agricultural Production

The household agricultural function is given by

$$Q = \theta f(A, L, X, K; \beta_q) \tag{1.0}$$

where: - $Q$: agricultural output;

- $\theta$: household's farming ability with $0 \le \theta \le 1$;

- $f(\bullet)$: the production function that is assumed to have standard properties, i.e. increasing, strictly quasi-concave, and continuously differentiable in its arguments;

- $A = \overline{A} + A^i - A^o$: operated farm size, of which $\overline{A}$ is initially owned land; $A^i$ or $A^o$ are the amount of land rented in or out, and $r^i$ or $r^o$ are associated prices for land rented in or out;

- $L = L^f + s\left(A, L^f\right) \cdot L^i$: the effective labour input in farming, of which $L^f$ is family farm labour, $L^i$ is nominal amount of hired labour and $s\left(A, L^f\right)$ is a supervision function with $0 \le s(\cdot) \le 1$. In addition, $\partial s / \partial L^f \ge 0$ and $\partial^2 s / \partial {L^f}^2 \le 0$. i.e. efficiency of supervision is a positive, but diminishes as hired labour increases for a given level of $A$; $\partial s / \partial A \le 0$ and $\partial^2 s / \partial A^2 \ge 0$, i.e. efficiency of supervision diminishes as the farm size grows for a given level of $L^f$. Also, $w^i < w^0$ is assumed due to moral hazards with hired labour and accompanying supervision costs.

- $X$ : the amount of purchased inputs with price $p_x$, and

- $K$: productive assets

Substituting $A = \overline{A} + A^i - A^o$ and $L = L^f + s\left(A, L^f\right) \cdot L^i$ into equation (1.0) gives

$$Q = \theta f\left(\overline{A} + A^i - A^o, L^f + s\left(A, L^f\right) \cdot L^i, X, K\right) \tag{1.1}$$

**2. Household Net Incomes**

The household net income is given by

$$y = Q - p_x X - r^i A^i - w^i L^i + r^o A^o + w^o L^o \qquad (2.0)$$

Substituting equation (1.1) into equation (2.0) gives

$$y = \theta f\left(\overline{A} + A^i - A^o, L^f + s\left(A, L^f\right) \cdot L^i, X, K\right) - p_x X - r^i A^i - w^i L^i + r^o A^o + w^o L^o \qquad (2.1)$$

**3. Household Consumption and Utility Function**

The household utility function is given by

$$U(y, l) = y + U(l) \qquad (3.0)$$

**4. Household Problem**

Replacing $y$ in equation (3.0) with equation (2.1) gives the household problem

$$\max_{\substack{L^f, L^i, L^o; \\ A^i, A^o, X}} \theta f\left(\overline{A} + A^i - A^o, L^f + s\left(A, L^f\right) \cdot L^i, X, K\right) - p_x X - r^i A^i - w^i L^i + r^o A^o + w^o L^o + U(l)$$

subject to

- liquidity constraint: $p_x X + (w^i L^i - w^o L^o) + (-) A^{i/(o)} \cdot r^{i/(o)} \le M + M\left(\overline{A}\right)$, where $M$ is liquid assets and $M(\overline{A})$ is the maximum amount of credit that the household can assumingly obtain by using its owned land $\overline{A}$ as collateral;
- off-farm wage employment constraint: $L^o \le \overline{L}^o$;
- farming ability and technology constraint: $Q = \theta f(A, L, X, K; \beta_q)$;
- time constraint: $\overline{L} = L^f + L^o + l$ with leisure (home time) $l$; and
- $A^i, A^0, L^i, L^o, L^f, l, X \ge 0$.

**5. Kuhn-Tucker Conditions and Household Decisions**

The Lagrangian function for the household problem can be expressed as

$$\Lambda = U\left(y, l\right) - \lambda_M \cdot [p_x X + w^i L^i + r^i A^i - M\left(\overline{A}\right) - M - w^o L^o - r^o A^o] - \lambda_L \cdot [L^o - \overline{L}^o] \qquad (4.0)$$

***5.1 Lessee Decisions***

From equation (4.0), the first order Kuhn-Tucker conditions with respect to $A^i$ are

$$\frac{\partial \Lambda}{\partial A^i} \le 0 \quad \text{and} \quad A^i \cdot (\frac{\partial \Lambda}{\partial A^i}) = 0$$

Equivalently, the first part of the above conditions can be expressed as

$$\frac{\partial U(y,l)}{\partial A^i} - \lambda_M^i \frac{\partial \left\{ p_x X + w^i L^i + r^i A^i - M\left(\overline{A}\right) - M - w^o L^o - r^o A^o \right]\right\}}{\partial A^i} - \lambda_L^i \frac{\partial [L^o - \overline{L}^o]}{\partial A^i} \le 0 \quad (4.1)$$

From equation (4.1), note that the first term $\frac{\partial U(y,l)}{\partial A^i}$ can be written as

$$\frac{\partial U(y,l)}{\partial A^i} = \frac{\partial U(y,l)}{\partial y}\frac{\partial y}{\partial A^i} + \frac{\partial U(y,l)}{\partial l}\frac{\partial l}{\partial A^i} = U_y \frac{\partial y}{\partial A^i} + U_l \frac{\partial l}{\partial A^i} \quad (4.1.a)$$

Equation (3.0) implies that $\frac{\partial l}{\partial A^i} = 0$ and that $U_y$=1, then (4.1.0) becomes

$$\frac{\partial U(y,l)}{\partial A^i} = \frac{\partial y}{\partial A^i} \quad (4.1.b)$$

From equation (2.1) and for a lessee household

$$\frac{\partial U(y,l)}{\partial A^i} = \frac{\partial y}{\partial A^i} = \theta^i \frac{\partial f\left(\overline{A} + A^i - A^o, L^f + s\left(A, L^f\right)\cdot L^i, X, K\right) - p_x X - r^i A^i - w^i L^i + r^o A^o + w^o L^o}{\partial A^i}$$

or

$$\frac{\partial U(y,l)}{\partial A^i} = \theta^i \frac{\partial f\left(\overline{A} + A^i - A^o, L^f + s\left(A, L^f\right)\cdot L^i, X, K\right)}{\partial A^i} - r^i \quad (4.1.c)$$

$$\begin{aligned}
&= \theta^i \frac{\partial f\left[\overline{A} + A^i - A^o, L^f + s\left(A, L^f\right)\cdot L^i, X, K\right]}{\partial\left[\overline{A} + A^i - A^o\right]} \cdot \frac{\partial\left[\overline{A} + A^i - A^o\right]}{\partial A^i} + \\
&+\theta^i \frac{\partial f\left[\overline{A} + A^i - A^o, L^f + s\left(A, L^f\right)\cdot L^i, X, K\right]}{\partial\left[L^f + s\left(A, L^f\right)\cdot L^i\right]} \cdot \frac{\partial\left[L^f + s\left(A, L^f\right)\cdot L^i\right]}{\partial A^i} + \\
&+\theta^i \frac{\partial f\left[\overline{A} + A^i - A^o, L^f + s\left(A, L^f\right)\cdot L^i, X, K\right]}{\partial X} \cdot \frac{\partial X}{\partial A^i} + \\
&+\theta^i \frac{\partial f\left[\overline{A} + A^i - A^o, L^f + s\left(A, L^f\right)\cdot L^i, X, K\right]}{\partial K} \cdot \frac{\partial K}{\partial T^i} \\
&-r^i
\end{aligned} \quad (4.1.d)$$

Note from equation (4.1.d) that

- $A = \overline{A} + A^i - A^o$ then the first line is equal to

$$\theta^i \frac{\partial f(\bullet)}{\partial A} \times \frac{\partial \left[ \overline{A} + A^i - A^o \right]}{\partial A^i} = \theta^i \frac{\partial f(\bullet)}{\partial A} \times \frac{\partial A^i}{\partial A^i} = \theta^i f_A^i$$

- $L = L^f + s\left(A, L^f\right) \cdot L^i$ then second line is equal to

$$\theta^i \frac{\partial f(\bullet)}{\partial L} \times \frac{\partial \left[ L^f + s\left(A, L^f\right) \cdot L^i \right]}{\partial A^i} = \theta^i \frac{\partial f(\bullet)}{\partial L} \times \frac{\partial s\left(A, L^f\right)}{\partial A^i} L^i = \theta^i f_L s_A^i \cdot L^i$$

- For the third and fourth lines: $\partial X / \partial A^i = 0$ and $\partial K / \partial A^i = 0$

Accordingly, the first term of equation (4.1) becomes

$$\frac{\partial U(y,l)}{\partial A^i} = \theta^i f_A^i + \theta^i f_L s_A^i \cdot L^i = \theta^i (f_A^i + f_L s_A^i \cdot L^i) - r^i \qquad (4.1.1)$$

The second term of equation (4.1) is

$$-\lambda_M^i \cdot \frac{\partial \left\{ [p_x X + w^i L^i + r^i A^i - M\left(\overline{A}\right) - M - w^o L^o - r^o A^o] \right\}}{\partial A^i} = -\lambda_M^i \cdot r^i \qquad (4.1.2)$$

The third term of equation (4.1) is

$$-\lambda_L^i \cdot \frac{\partial [L^o - \overline{L}^o]}{\partial A^i} = 0 \ (\text{as } \frac{\partial [L^o - \overline{L}^o]}{\partial A^i} = 0) \qquad (4.1.3)$$

From equations (4.1.1)-(4.1.3), the first order Kuhn-Tucker conditions for the optimal operated farm size of the lessee household become

$$\theta^i (f_A^i + f_L s_A^i \cdot L^i) - \left(1 + \lambda_M^i\right) r^i \le 0; \ A^i \frac{\partial \Lambda}{\partial A^i} = 0$$

which is condition (3.1) in Chapter 3.

### *2.2.2 Lessor Decisions*

Similar approach is applied to the lessor household. The first order Kuhn-Tucker conditions for the optimal operated farm size of the lessor household is given by

$$-\theta^o (f_A^o + f_L s_A^o \cdot L^i) + \left(1 + \lambda_M^o\right) r^o \le 0; \ A^o \frac{\partial \Lambda}{\partial A^o} = 0$$

which is condition (3.2) in Chapter 3.

# Appendix B

**Table B.1 The sample of rural households with cropland and its sub-populations**

| Items | Pooled sample (n=11,430) | 2004 (n=5,782) | 2008 (n=5,648) | Change |
|---|---|---|---|---|
| **Before market participation** | | | | |
| Landless lessee (1 if yes, 0 otherwise) | 0.00952*** (0.00105) | 0.00769*** (0.00120) | 0.0112*** (0.00161) | 0.0035* (0.00196) |
| Landed household (1 if yes, 0 otherwise) | 0.990*** (0.00105) | 0.992*** (0.00120) | 0.989*** (0.00161) | -0.0035* (0.00196) |
| **Market participation** | | | | |
| Pure lessee (1 if yes, 0 otherwise) | 0.0972*** (0.00330) | 0.101*** (0.00447) | 0.0933*** (0.00460) | -0.0082 (0.00636) |
| Household that both rents in and out land (1 if yes, 0 otherwise) | 0.00391*** (0.000614) | 0.00509*** (0.000938) | 0.00282*** (0.000745) | -0.0023* (0.00116) |
| Pure lessor (1 if yes, 0 otherwise) | 0.0758*** (0.00287) | 0.0629*** (0.00350) | 0.0877*** (0.00428) | 0.025*** (0.00547) |
| Autarky household (1 if yes, 0 otherwise) | 0.823*** (0.00434) | 0.831*** (0.00571) | 0.816*** (0.00610) | -0.014* (0.00829) |
| **After market participation** | | | | |
| Absentee lessor (1 if yes, 0 otherwise) | 0.0303*** (0.00181) | 0.0232*** (0.00211) | 0.0367*** (0.00275) | 0.014*** (0.00341) |
| Farming household (1 if yes, 0 otherwise) | 0.924*** (0.00294) | 0.935*** (0.00352) | 0.914*** (0.00436) | -0.021*** (0.00568) |
| Land idle household (1 if yes, 0 otherwise) | 0.0461*** (0.00235) | 0.0421*** (0.00286) | 0.0497*** (0.00349) | 0.0076 (0.00469) |

Source: Computed from VHLSS04 and VHLSS08. Sample weights are used.

Note: *, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively.

# Appendix C

**Table C.1 Tests of hypotheses for coefficients of the explanatory variables estimated for the technical inefficiency effects in the stochastic frontier production function**

| Null hypothesis[a] | $\log L(\hat{\Omega}_{H0})$ [d] | $\lambda$ | $k$ | Critical value $\alpha = 1\%$ | Decisions |
|---|---|---|---|---|---|
| $H_0 : \gamma = \delta_0 = \delta_1 = ... = \delta_{18} = 0$ [b] | -5050.6 | 286.2 | 20 | 36.935 | Reject $H_o$ |
| $H_0 : \gamma = 0$ [c] | -4900.1 | 14.8 | 3 | 10.501 | Reject $H_o$ |
| $H_0 : \delta_1 = \delta_2 = ... = \delta_{18} = 0$ | -5050.6 | 286.2 | 18 | 34.167 | Reject $H_o$ |

Source: Computed from VHLSS04 and VHLSS08.

Note: [a] In words:

- *The first hypothesis*: The inefficiency effects are not present (or, equivalently, the mean production function is an adequate representation of the data).
- *The second hypothesis*: The inefficiency effects are not stochastic (i.e. the random component of the inefficiency effects is absent)
-*The third hypothesis*: The coefficients of the explanatory variables in the model for the inefficiency effects are simultaneously zero (and hence that the technical inefficiency effects have the same truncated-normal distribution)

[b] When $\mu$ = 0 and $\sigma_u$ = 0, the truncated-normal model reduces to a linear regression model with normally distributed errors. However, the distribution of the test statistic under the null is not well established (it becomes impossible to evaluate the log-likelihood as $\sigma_u \to 0$). Coelli (1995) derived a *one-sided test* for the presence of the inefficiency term by identifying negative skewness in the residuals from an OLS regression with the presence of an inefficiency term.

[c] If the parameter $\gamma$ is zero, then the variance of the inefficiency effects is zero and so the model reduces to a traditional mean response function in which the variables explaining technical efficiency are included in the production function. In this case, the parameters $\delta_0$ and the coefficient for FARMASSET are not identified.

[d]
- $\log L(\hat{\Omega}_{H0})$ is the log likelihood of constrained models under the null
- $\log L(\hat{\Omega}_{H1})$ is the log likelihood of the alternative hypothesis (no restrictions) in Table 5.3. The results presented in the table were obtained after running 10,000 iterations.
- $\lambda = -2[\log L(\hat{\Omega}_{H0}) - \log L(\hat{\Omega}_{H1})]$ ;
- $k$ = number of restrictions;
- The correct critical values are obtained from Table I of Kodde and Palm (1986, p. 1 246) for degrees of freedom 20, 3 and 18, respectively.

**Table C.2 Multicollinearity diagnostics for the stability of the stochastic production frontier model**

| Variable | VIF | SQRT VIF | Tolerance |
|---|---|---|---|
| SOWNAREA | 2.50 | 1.58 | 0.3993 |
| LABOUR | 1.44 | 1.20 | 0.6953 |
| FARMASSET | 1.05 | 1.02 | 0.9545 |
| SEED | 1.02 | 1.01 | 0.9779 |
| FERTILIZER | 2.68 | 1.64 | 0.3729 |
| OTHERINPUT | 2.58 | 1.61 | 0.3877 |
| HIRELABOUR | 1.22 | 1.11 | 0.8184 |
| HIRETRACTION | 1.33 | 1.15 | 0.7546 |
| IRRIGATION | 1.40 | 1.18 | 0.7144 |
| DELTA | 6.42 | 2.53 | 0.1557 |
| MIDLAND | 2.52 | 1.59 | 0.3972 |
| MOUNTAIN | 7.40 | 2.72 | 0.1352 |
| REGION2 | 2.51 | 1.58 | 0.3984 |
| REGION3 | 1.86 | 1.36 | 0.539 |
| REGION4 | 1.52 | 1.23 | 0.6568 |
| REGION5 | 1.35 | 1.16 | 0.7417 |
| REGION6 | 1.96 | 1.40 | 0.5108 |
| REGION7 | 1.46 | 1.21 | 0.6853 |
| REGION8 | 1.65 | 1.28 | 0.6067 |
| YEAR | 1.04 | 1.02 | 0.9577 |

Source: Computed from VHLSS04 and VHLSS08.

Note: Mean VIF is 2.25.

**Table C.3 Multicollinearity diagnostics for the stability of the technical efficiency model**

| Variable | VIF | SQRT VIF | Tolerance | VIF (excludingHEADAGE2) |
|---|---|---|---|---|
| RICEZONING | 1.07 | 1.03 | 0.9361 | 1.07 |
| LANDTITLED | 1.08 | 1.04 | 0.9264 | 1.08 |
| LANDRENTED | 1.06 | 1.03 | 0.9449 | 1.06 |
| PLOT100 | 1.03 | 1.01 | 0.9709 | 1.03 |
| FARMASSET | 1.02 | 1.01 | 0.9811 | 1.02 |
| HHLDSIZE | 1.15 | 1.07 | 0.8723 | 1.11 |
| SELFFARM | 1.09 | 1.04 | 0.9182 | 1.06 |
| HEADEDU | 1.35 | 1.16 | 0.7412 | 1.28 |
| FEMALE | 1.16 | 1.08 | 0.8631 | 1.15 |
| HEADAGE | 46.78 | 6.84 | 0.0214 | 1.18 |
| HEADAGE2 | 47.32 | 6.88 | 0.0211 | - |
| REMITTANCE | 1.03 | 1.01 | 0.9743 | 1.03 |
| LOANVALUE | 1.02 | 1.01 | 0.9773 | 1.02 |
| EXTENSION | 1.02 | 1.01 | 0.9794 | 1.02 |
| POORHHLD | 1.08 | 1.04 | 0.9289 | 1.08 |
| RELIGION | 1.10 | 1.05 | 0.9088 | 1.10 |
| REMOTE | 1.22 | 1.11 | 0.818 | 1.22 |
| FARMWAGE | 1.12 | 1.06 | 0.8901 | 1.12 |

Source: Computed from VHLSS04 and VHLSS08.

Note*:* Mean VIF is 6.21 (the mean VIF is of 1.10 when excluding the HEADAGE2 variable).

# Appendix D

**Table D.1 The Brant test of the parallel regression assumption**

| Items | Chi2 statistics | p>Chi2 | df |
|---|---|---|---|
| **All variables** | 593.14 | 0 | 37 |
| **Individual variables** | | | |
| ENDOWAREA | 35.70 | 0.000 | 1 |
| ENDOWPLOT | 29.77 | 0.000 | 1 |
| DELTA | 17.02 | 0.000 | 1 |
| MIDLAND | 0.47 | 0.493 | 1 |
| MOUNTAIN | 0.16 | 0.687 | 1 |
| HHLDSIZE | 39.97 | 0.000 | 1 |
| CHILDDEPCY | 6.60 | 0.010 | 1 |
| WIDOW | 2.51 | 0.113 | 1 |
| HEADAGE | 0.03 | 0.874 | 1 |
| HEADAGE2 | 0.01 | 0.910 | 1 |
| HHLDEDU | 1.36 | 0.243 | 1 |
| EXPERIENCE | 0.94 | 0.332 | 1 |
| SELFFARM | 4.32 | 0.038 | 1 |
| EXTENSION | 5.12 | 0.024 | 1 |
| FARMWAGE | 7.31 | 0.007 | 1 |
| FARMASSET | 0.38 | 0.540 | 1 |
| REMITTANCE | 8.39 | 0.004 | 1 |
| LOANVALUE | 21.45 | 0.000 | 1 |
| REGIONCPI | 4.95 | 0.026 | 1 |
| REGION2 | 1.41 | 0.236 | 1 |
| REGION3 | 1.82 | 0.177 | 1 |
| REGION4 | 6.69 | 0.010 | 1 |
| REGION5 | 0.41 | 0.521 | 1 |
| REGION6 | 1.67 | 0.196 | 1 |
| REGION7 | 0.06 | 0.803 | 1 |
| REGION8 | 6.01 | 0.014 | 1 |
| YEAR | 5.06 | 0.024 | 1 |
| ENDOWTITLED | 2.51 | 0.113 | 1 |
| RICEZONING | 144.23 | 0.000 | 1 |
| LANDDISPUTE | 1.43 | 0.231 | 1 |
| OWNPHONE | 11.13 | 0.001 | 1 |
| RADIOSTATION | 0.00 | 0.989 | 1 |
| OWNVEHICLE | 0.16 | 0.687 | 1 |
| CMNROAD | 1.81 | 0.178 | 1 |
| CMNMARKET | 1.63 | 0.202 | 1 |
| ETHNICITY | 11.81 | 0.001 | 1 |
| RELIGION | 10.06 | 0.002 | 1 |

Source: Computed from VHLSS04 and VHLSS08.

Note: A significant test statistic provides evidence that the parallel regression assumption has been violated.

**Table D.2 The Likelihood Ratio test of the parallel regression assumption**

| Null hypothesis | $\log L(\widehat{\Omega}_{H0})$ [a] | $\lambda$ | $k$ | P-value | Decisions |
|---|---|---|---|---|---|
| $H_0$: The standard ordered logit model is adequate | -5717.16 | 127.02 | 10 | 0.000 | **Reject $H_o$** |

Source: Computed from VHLSS04 and VHLSS08.

Note: [a] - $\log L(\widehat{\Omega}_{H0})$ is the log likelihood of constrained models under the null;

- $\log L(\widehat{\Omega}_{H1})$ is the log likelihood of the alternative hypothesis (no restrictions) in Table 6.3;
- $\lambda = -2[\log L(\widehat{\Omega}_{H0}) - \log L(\widehat{\Omega}_{H1})]$ ;
- $k$ = number of restrictions;
- P-value is defined as $1 - \text{Prob}(\chi^2(k, \lambda) > 0)$

**Table D.3 Multicollinearity diagnostics for the stability of the model**

| Variable | VIF | SQRT VIF | Tolerance | VIF (excluding HEADAGE2) |
|---|---|---|---|---|
| ENDOWAREA | 1.28 | 1.13 | 0.7816 | 1.28 |
| ENDOWPLOT | 1.55 | 1.25 | 0.6437 | 1.55 |
| DELTA | 5.96 | 2.44 | 0.1679 | 5.95 |
| MIDLAND | 2.43 | 1.56 | 0.4109 | 2.43 |
| MOUNTAIN | 7.23 | 2.69 | 0.1384 | 7.21 |
| HHLDSIZE | 1.48 | 1.22 | 0.6758 | 1.45 |
| CHILDDEPCY | 1.70 | 1.31 | 0.5867 | 1.61 |
| WIDOW | 1.19 | 1.09 | 0.8397 | 1.19 |
| HEADAGE | 44.04 | 6.64 | 0.0227 | 1.86 |
| HEADAGE2 | 46.12 | 6.79 | 0.0217 | - |
| HHLDEDU | 1.55 | 1.24 | 0.6455 | 1.49 |
| EXPERIENCE | 1.70 | 1.30 | 0.5888 | 1.67 |
| SELFFARM | 1.30 | 1.14 | 0.7712 | 1.29 |
| EXTENSION | 1.08 | 1.04 | 0.9229 | 1.08 |
| FARMWAGE | 1.66 | 1.29 | 0.6007 | 1.66 |
| FARMASSET | 1.33 | 1.16 | 0.7495 | 1.33 |
| REMITTANCE | 1.12 | 1.06 | 0.8929 | 1.12 |
| LOANVALUE | 1.06 | 1.03 | 0.9454 | 1.06 |
| REGIONCPI | 6.82 | 2.61 | 0.1467 | 6.82 |
| REGION2 | 3.03 | 1.74 | 0.33 | 3.02 |
| REGION3 | 2.90 | 1.70 | 0.3444 | 2.90 |
| REGION4 | 1.66 | 1.29 | 0.6012 | 1.66 |
| REGION5 | 1.64 | 1.28 | 0.6087 | 1.64 |
| REGION6 | 4.35 | 2.09 | 0.2298 | 4.35 |
| REGION7 | 4.85 | 2.20 | 0.2061 | 4.85 |
| REGION8 | 3.70 | 1.92 | 0.2703 | 3.70 |
| YEAR | 3.46 | 1.86 | 0.2888 | 3.46 |
| ENDOWTITLED | 1.10 | 1.05 | 0.9057 | 1.10 |
| RICEZONING | 1.41 | 1.19 | 0.7091 | 1.41 |
| LANDDISPUTE | 1.13 | 1.06 | 0.8836 | 1.13 |
| OWNPHONE | 1.63 | 1.28 | 0.6143 | 1.63 |
| RADIOSTATION | 1.49 | 1.22 | 0.6722 | 1.49 |
| OWNVEHICLE | 1.44 | 1.20 | 0.6965 | 1.44 |
| CMNROAD | 1.18 | 1.08 | 0.8505 | 1.18 |
| CMNMARKET | 1.09 | 1.04 | 0.9165 | 1.09 |
| ETHNICITY | 1.89 | 1.38 | 0.5288 | 1.89 |
| RELIGION | 1.51 | 1.23 | 0.6639 | 1.51 |

Source: Computed from VHLSS04 and VHLSS08.

Note*:* Mean VIF is 4.60 (the mean VIF is of 2.26 when excluding the HEADAGE2 variable).

**Table D.4 Estimation of average marginal effects**

| Variables | Descriptions | Lessor regime | Autarkic regime | Lessee regime |
|---|---|---|---|---|
| **Motives for market participation** | | | | |
| ENDOWAREA | Cropland endowment (ha) | 0.0075*** | 0.0036*** | -0.011*** |
| ENDOWPLOT | No. of endowed cropland plots | 0.0083*** | 0.0040*** | -0.012*** |
| DELTA | Delta commune (1 if yes, 0 otherwise) | 0.012* | 0.0061*** | -0.018** |
| MIDLAND | Midland commune (1 if yes, 0 otherwise) | 0.012 | 0.0039*** | -0.016 |
| MOUNTAIN | Mountainous commune (1 if yes, 0 otherwise) | 0.010 | 0.0044** | -0.015 |
| HHLDSIZE | Adult equivalent household size (persons) | -0.0052*** | -0.0025*** | 0.0077*** |
| CHILDDEPCY | Child dependency ratio | -0.047*** | -0.023*** | 0.070*** |
| WIDOW | Widow-headed household (1 if yes, 0 otherwise) | 0.0038 | 0.0017 | -0.0055 |
| HEADAGE | Age of the head (years) | 0.0023*** | 0.0011*** | -0.0035*** |
| HEADAGE2 | Square of head age | -0.014 | -0.0066 | 0.020 |
| HHLDEDU | Education of the household (yrs) | -0.0014** | -0.00069** | 0.0021** |
| EXPERIENCE | Farming experience of the household (yrs) | -0.00098*** | -0.00048*** | 0.0015*** |
| SELFFARM | Self-employed farmer (1 yes, 0 otherwise) | -0.017*** | -0.0075*** | 0.025*** |
| EXTENSION | Visits by agricultural extension agents to commune | 0.00030** | 0.00015** | -0.00045** |
| FARMWAGE | Commune average farm wage (1000VND/hr) | -0.0051*** | -0.0025*** | 0.0076*** |
| FARMASSET | Value of farm assets (1000VND) | -0.0048*** | -0.0023*** | 0.0072*** |
| REMITTANCE | Income from remittances (1000VND) | 0.00081 | 0.00039 | -0.0012 |
| LOANVALUE | Total loan amount (1000VND) | -0.0011*** | -0.00054*** | 0.0016*** |
| REGIONCPI | Regional CPI (in January 2004 prices, Rural Red River Delta =1) | 0.077 | 0.037 | -0.11 |
| REGION2 | North East (1 if yes, 0 otherwise) | -0.0096 | -0.0059 | 0.016 |
| REGION3 | North West (1 if yes, 0 otherwise) | 0.010 | 0.0034 | -0.013 |
| REGION4 | North Central Coast (1 if yes, 0 otherwise) | -0.011** | -0.0070* | 0.018** |

*(continued)*

**Table D.4 Estimation of average marginal effects** *(continued)*

| Variables | Descriptions | Lessor regime | Autarkic regime | Lessee regime |
|---|---|---|---|---|
| | **Motives for market participation** | | | |
| REGION5 | South Central Coast (1 if yes, 0 otherwise) | -0.0092* | -0.0059 | 0.015 |
| REGION6 | Central Highlands (1 if yes, 0 otherwise) | -0.023** | -0.022 | 0.045* |
| REGION7 | South East (1 if yes, 0 otherwise) | -0.023** | -0.021 | 0.044* |
| REGION8 | Mekong River Delta (1 if yes, 0 otherwise) | -0.018*** | -0.013* | 0.032** |
| YEAR | Time dummy (1 if 2008, 0 otherwise) | 0.0095* | 0.0046** | -0.014* |
| | **Impact of transaction costs** | | | |
| ENDOWTITLED | Share of endowed cropland area with LUC (%) | 0.00018*** | 0.00030*** | -0.00048*** |
| RICEZONING | Rice zoning index | -0.12*** | 0.060*** | 0.059*** |
| LANDDISPUTE | Commune has land conflicts and disputes (1 if yes, 0 otherwise) | -0.0015 | 0.013* | -0.011** |
| OWNPHONE | Household owns a telephone (1 if yes, 0 otherwise) | 0.030*** | -0.031*** | 0.00079 |
| RADIOSTATION | Commune has a radio relay station (1 if yes, 0 otherwise) | 0.025*** | -0.023** | -0.0026 |
| OWNVEHECLE | Household owns a motorised vehicle (1 if yes, 0 otherwise) | -0.0040 | 0.018** | -0.014** |
| CMNROAD | Commune has all-weather roads (1 if yes, 0 otherwise) | 0.012** | -0.026*** | 0.014** |
| CMNMARKET | Commune has a local market (1 if yes, 0 otherwise) | 0.0044 | -0.011 | 0.0070 |
| ETHNICITY | Commune has diverse ethnic groups (1 if yes, 0 otherwise) | -0.046*** | 0.093*** | -0.047*** |
| RELIGION | Commune has diverse religions (1 if yes, 0 otherwise) | 0.0084 | -0.015** | 0.0066 |
| | Observations | | 11,430 | |

Source: Computed from VHLSS04 and VHLSS08.
Note: *, **, ***: significantly different from zero at the 10%, 5% and 1% level of probability, respectively.